MILITARY REVIEW

VOLUME XXVI OCTOBER 1946 NUMBER 7

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MILITARY REVIEW—Published monthly by the Command and Staff College at Fort Leavenworth, Kansas. Entered as second-class matter August 31, 1934, at the Post Office at Fort Leavenworth, Kansas, under the Act of March 3, 1897. Subscription rates: $3.00 (U.S. currency) per year for 12 issues. No extra charge for foreign postage on new or renewal subscriptions. Reprints are authorized, provided credit is given the "MILITARY REVIEW," C&SC, Fort Leavenworth, Kansas.

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Personnel Management in the Army

MAJOR GENERAL WILLARD S. PAUL, *General Staff Corps*
Assistant Chief of Staff, G-1, War Department General Staff

Personnel Management Weakness of World War II

THE things needed for success in war are men, money, equipment, and ideas. Without the proper utilization of the first—men—not much can be done with the others. The adequate supply, classification, and delivery of men in good physical and mental condition to the point where they can use good ideas (or plans) and material to win battles is a personnel management job and falls primarily on the shoulders of G-1.

The Army as a whole did not profit by the personnel management problems pointed out in World War I. For example, the practical application of systematic and adequate classification and assignment procedures had not been accomplished by the outset of World War II, and their importance did not come into general acceptance until the mid-war period.

The rapid expansion of the Army just prior to and during World War II pointed out the fact that both within the regular establishments and the reserve components, few, if any, qualified officers with G-1 experience were available to handle the tremendous personnel problems incident to the mobilization of a 10,000,000 man army. In this connection, I cannot emphasize too strongly the fact that a 10,000,000 man army presents 10,000,000 actual or potential personnel problems. Personnel, unlike beans, socks, or tanks, cannot be placed in a dump and left virtually unattended until needed. The human element is always present and requires constant, humanized and intelligent attention at all times. The human equation cannot be overlooked in a successful army, and personnel management is a function not only of G-1 but also of every officer and non-commissioned officer if we are to have an effective fighting force. All individuals must be constantly attentive to this problem regardless of the tactical situation.

Overall personnel policies must, of course, be developed and supervised by experienced personnel managers (G-1s) who have had sound scientific training in this field. Too often in the past the Army has suffered from personnel policies which, like Topsy, have "just growed." The Army must prepare in peace, through continuing personnel research, education and practical application, adequate personnel plans and methods which will stand the test of any future emergency. Past instances of competition with other agencies, particularly the Navy for personnel must not be repeated if we are to avoid costly, time-consuming, competitive recruiting, problems. Within the Army itself, by adequate planning, we must avoid our mistake of World War II of removing high-grade individuals and civilian specialists from the replacement stream for early activation of Air Force and Service Force units, with the ultimate result that Ground Force units which were activated later got the dregs.

Essentiality of a Sound Army Personnel System

Business and industry have long recognized that overall efficiency is a product, not only of scientific management in the strict sense of the term, but of wise human relations as well. The attention of business leadership is being focused as much on men as on methods. Business is finding means to provide, in increasing measure, the things every individual in industry wants, namely, justice in terms of fair play and fair dealing, a sense of individual importance, opportunity and security. They have long recognized the dollar and cents value of practicing the most basic principle of personnel placement, namely the utilization of the right man in the right place at the right time.

If business and industry have found it advisable to stress sound personnel management it is even more important for the military not only to follow quickly, but actually to take the lead. The Army in World War II

was the biggest this nation has ever experienced. Normally we think of the General Motors Corporation as big business. They, however, employ less than 500,000 people. United States Steel with slightly over 300,000 and General Electric with some 170,000 employees are likewise big busines.

The Army by the same standards is colossal business. During the period 1 November 1940 through 1 January 1946, approximately 10,900,000 people served in it. Of this number over 7,300,000 saw overseas duty. Our peak strength on VE-day was 8,300,000 of which about 900,000 were officers. When one further considers that those 8,300,000 men and women were not employed in a few factory buildings, as in the case of General Motors, but fighting a war in every corner of the globe, one realizes what big business actually is.

Criteria of a Sound Army Personnel System

The Army must, in order to live up to the high degree of efficiency expected of it, keep faith with the Nation and have very clearly in mind just what it intends to do about the whole problem of personnel management. We can no longer let unforeseen personnel problems arise, solve them on the spur of the moment and under the pressure of war, and then justify our actions because of the exigencies of the situation. Rather we must have an intelligently planned program and be in a position to execute it with integrity, acumen, and wisdom.

It is therefore imperative that we have a simple, flexible, scientific and workable system which can be understood readily, and operated efficiently through normal chains of command. Further, it must be capable, by means of accounting procedures, of estimating accurately present and future resources and requirements.

Flexibility is one of the primary criteria that any personnel system must possess. The system must be sufficiently flexible to meet the changing situation, but it should be specifically directed toward the four periods in the war cycle of this or any nation. These four periods are—demobilization, peace, mobilization, and actual combat. Any acceptable personnel plan must consider these four periods.

First, the demobilization period is one of utmost difficulty because of public opinion entanglements and the resulting congressional pressure. As master in the demobilization period, the public is entitled to know what our plans for demobilization are, and the effect those plans will have on our position in the World of Nations. During the war the American public accepted the decisions of the War Department because they had faith in it. If the War Department feels that we are demobilizing too fast, let us present our case to the public and to their representatives in Congress. The American public is just as interested in the future of their country as is the Army.

Second, Peacetime. It is a period of ebb tide but a period in which plans must be made and constant research carried on. Everything for the Army will be at a premium. It is not a time for empire building. It is a time to make as little as possible go as far as possible. It is a period in which everything must be done to keep the caliber of the personnel at a high level. By all means, it must not be a period of relaxation. Skeleton teams must be established in which each member can play several positions. Plans must be laid for sudden and vast expansion, and the plans must include all components of the Army.

Third, The Mobilization Period. It is one in which the personnel plan evolved during peacetime receives its first practical test. It is well to remember that in World War II this nation had approximately three years to mobilize its armed forces. We may not have three months next time, so our plan must be good.

Fourth, The Period of Actual Combat. This is the pay-off. If personnel plans evolved and expanded in peace and mobilization times are fundamentally sound, they should not require too much alteration during this vital period.

Establishment of an Army Personnel System

With the difficulties and problems which

we have encountered, the errors which we have made, and the criteria which we have established well in mind, our task is clearly outlined and our goal well defined. We must set about in earnest to establish an army personnel system which will be a model for all organized effort.

The Simpson Plan

This is the plan by which the Assistant Chief of Staff, G-1 is designated as the Director of Personnel and Administration and will be the actual military personnel manager of the War Department. It is contemplated that except for certain high level command matters, the War Department will deal directly with the Army headquarters with regard to personnel and administrative matters. The Director of Personnel and Administration is the advisor to and the assistant of the Chief of Staff on all matters relating to personnel as individuals. He has the overall War Department responsibility for the procurement and allocation of personnel in bulk to the major commands and for the demobilization of individuals from the military service.

The Gerow Plan

On 23 November 1945, the War Department established a War Department Education Board with General Gerow as its president. From the study of this board came the School System for Officers of the Army. This school system encompasses five levels of schooling; Basic, Advanced, Command and Staff College, Armed Forces College, and the National War College and Industrial College.

Personnel management and administration will be taught at all levels of this school system. The basic school, which all officers newly entering the service will attend, instructs the student in the fundamental principles, and each successive higher level will present its instruction on the appropriate level. For example, the Command and Staff College will utilize fifteen of its forty-one weeks total in presenting subject matter pertinent to personnel and administration which will be on the Division, Corps and Army level while the two higher levels will study personnel matters on a national and international level.

Job Analysis

One of the greatest criticisms made of the War Department during the past war has been in connection with classification and assignment procedures through which an attempt is made to fit square pegs in round holes. It must be realized that the number of men needed in each job category is, in the usual case, much less than the men available for the jobs. The War Department is now improving its method of determining exactly what the specifications of the many jobs involved are, and what the qualifications of the individuals who may be assigned to them should be. At the present time army-wide analysis of all military jobs is being undertaken to include both peacetime and wartime requirements for officers and enlisted men in T/O and non T/O positions. Job surveys are being made as far as possible on the job and under operating conditions, and using the recorded experiences of the war. The process will produce job standards of proficiency, experience, education, training and physical capacity, including minimal standards on MOS qualification for promotion. Where necessary, variations in standards will be indicated as between Regular Army, National Guard and Organized Reserves. It is contemplated that the occupational index and coding system will be revised on the basis of comprehensive job analysis to show relationships, groupings, equivalences and differentiation among military duties.

Replacement System

The first step in the replacement system is procurement of the raw material. At present we have two sources—inductees from selective service and enlistees in the Regular Army. However, throughout the mobilization period and during actual hostilities selective service intake was virtually our only source of new manpower. Until the latter part of the mobilization period this source had relatively few limitations. Likewise, before demand for combat replacements became significant, determination of the numbers to

be called each month was a matter of simple arithmetic—that is, how many men did the T/O's of units on the activation schedules of the major commands total each month? Once mobilization was largely completed, combat operations on a global basis made replacements our major requirement,—a problem entirely different. First, the heavy drafts during the mobilization period had seriously depleted national manpower resources and threatened the war effort of industry and the civilian economy as a whole to the extent that selective service could not meet in full the calls placed by the Army and Navy. Second, the precise determination of replacement requirements nearly a year in advance presented almost insurmountable difficulties.

During most of the war the normal prescribed replacement training cycle was seventeen weeks. Obviously, each man could not be assigned to a training unit on the day of his arrival, nor could all men be shipped from training centers on the day training was completed. Thus, a week to fill training units and a week to empty units was taken, bringing the normal replacement training cycle to nineteen weeks. Upon graduation from training centers men were ordered to replacement depots in the Zone of Interior with a delay enroute or pre-embarkation furlough of up to fifteen days plus travel time. Because of the many sources from which replacements poured into the overseas replacement depots of the three major commands, and because of the necessity for uniformity of records, clothing, immunization, etc., depot processing and assignment to specific shipments required another week to ten days. In many instances the proper proportion of arm or service and MOS required by certain theaters was not present, which required holding large numbers of replacements who were otherwise available for shipment. Instances have occurred when replacements were held in depots as long as six weeks. Upon call to ports (which was often delayed by transportation difficulties) the men were forwarded to staging areas for further processing and staging before they actually boarded ship. This period at ports usually averaged about a week. Actual time at sea varied, according to destination and speed of transportation, from eight to thirty or more days. Approximately another month was often taken in theaters for further processing and assignment before a replacement joined a unit. Summing this all up, we have the following time schedule for replacements:

Selective Service Call	8 weeks
Reception Center	1 week
Replacement Training Center	19 weeks
Furlough and Travel	3 weeks
ZI Depot	2 weeks
Port	1 week
Transportation to Overseas Destination	2 weeks
Overseas Depot	4 weeks
Total	40 weeks

Thus, approximately ten months elapsed from the time a selective service call was placed until the man actually arrived in his overseas unit. Nor does this take into account the planning period required by the War Department prior to the placing of the call, which included contact and correspondence with the theater and normally took nearly two months. Thus we get a total of twelve months for the complete time required from the planning stage to the actual arrival of the replacement in his combat unit.

A second major problem which caused us no end of trouble in the replacement system, and one inextricably tied up with the long period required to produce replacements, was the startling numbers that were lost from the stream. Many of the losses were justifiable, but the seepage in some instances appeared unaccountably large. In the early days of the war, for every 100 enlisted men going into the replacement system only fifty actually were utilized as replacements. The disposition of the other fifty fell largely in the following categories: Discharge, Limited Service, Overhead, OCS, Special Assignment Because of Skills, Schools, Air Corps Cadet Training, ASTP, etc.

In the later stages of the war these losses were reduced to about twenty out of every 100, but they were a constant source of difficulty and were continually throwing calculations off by from twenty to fifty per cent.

There were, and still are, other shortcomings in the system. We have undoubtedly been guilty of duplicate processing, we were at times guilty of hurried processing in reception centers when the large inflow in the days of heavy calls overtaxed housing facilities, we have seen the pendulum of classification swing from overemphasis on the utilization of civilian skills, resulting in assignment of most of the lower physical and mental categories to the combat arms, to the other extremes of assignment based almost solely on physical standards with little regard for utilization of related civilian skills.

Limited Service

Limited service becomes an important topic as soon as manpower goes on the scarce item list. Less than a year after Pearl Harbor the Army realized it must investigate the vast number of physical rejectees and salvage usable men for service. It had always been known that less than ten per cent of the army would be required to undergo the rigors of physical hardship found in front-line combat. Yet we had required general service physical standards for all inductees. Finally, June 1942 found an experimental group of some 800 men who normally would have been rejected for physical reasons heading for training centers. This was the vanguard of the thousands of men in the category called limited service who were to follow.

In August 1942, a War Department directive clearly established the policy for bringing in the new group, assigning percentages to go to the three major forces. In close cooperation with the Surgeon General, G-1 prescribed the new physical standards for acceptance.

The program soon provided a large group of usable manpower. During the year 1943 alone, more than 100,000 limited service men were accepted at the induction centers. However, with the admission of these new men came new problems. The first concerned the method of assignment. Men with physical defects could not be given assignments which required full physical ability. Most of the new group were assigned to static units in the Zone of Interior, but unfortunately, some were placed in jobs requiring rigorous training. The result was hospitalization and eventual return to civilian life. From June to November 1942 separation of men for physical disability not connected with combat doubled.

It was not until 1945 when a physical profile system was devised that proper physical classification was possible. The physical profile took the first step toward placing a man of limited physical ability in a job which he could perform with creditable efficiency.

Psychoneurosis

One of the most troublesome problems was that of psychoneurosis. It was even more troublesome because the average officer knew so little about it, and in all too many cases refused to learn because he sincerely felt that many of the symptoms and reactions were fancied, not real.

Psychoneurosis (used interchangeably with neurosis) is a generic term referring to a group of mental illnesses characterized by symptoms relating to anxiety. They should be clearly distinguished from other types of neuro-psychiatric disorders, such as psychosis (various types of insanity), transient emotional responses, psychopathic personality and mental deficiency. Neurotic symptoms occur in everyone, but only when these become sufficiently pronounced as to impair markedly an individual's capacity to function, should they be given a diagnosis of some type of psychoneurosis.

The following figures relate to army experience from 1942 through 1945. Thirty-one per cent of the 1,750,000 men rejected for neuropsychiatric disorders at induction centers were for psychoneurosis. Of approximately 1,000,000 admissions to hospitals for neuro-psychiatric disorders, sixty-four per

cent (640,000) were for psychoneurosis. For every case of psychoneurosis admitted to a hospital, there were at least three additional cases seen in out-patient clinics. There were 224,000 discharged for psychoneurosis, which accounted for seventy per cent of the neuro-psychiatric medical discharges. Approximately fifteen to twenty-five per cent of all battle casualties were neuro-psychiatric. These were almost entirely psychoneurosis. In certain campaigns there was evidence to suggest that all men not otherwise disabled ultimately became or would have become psychiatric casualties. Therefore the question was not *who* would be a psychiatric causalty, but *when* would a man become a psychiatric casualty.

Psychoneurosis is a sickness which always represents maladjustment of the individual to his situation. It may develop in a normal person under severe stress or become evident in a less well organized individual under slight stress.

Utilization of men with neuroses depended largely on manpower needs. Initially, directives indicated that individuals with neurotic tendencies should be rejected and all types of psychoneurosis were discharged. The British were far more effective in the utilization of these men, chiefly through the medical and psychological study during the first weeks in a basic training camp. Of special significance in the utilization of individuals suffering from psychoneurosis is the adverse effect on morale of an unduly lenient disposition policy which permits the discharge of men who could have rendered service had they been retained.

Demobilization

The strength of the army as of VJ-day was 8,300,000 officers and men. The strength of the interim army was announced as over 2,000,000 and later cut to 1,550,000 men. Upon the capitulation of our enemies, it became incumbent upon the War Department to release immediately over 6,000,000 men. A system of release was formulated, but lack of time precluded a system based upon an actual nose count. Therefore, the two per cent cross-section survey previously compiled by War Department survey teams became the basis upon which demobilization was based.

In formulating a just plan for demobilization, two main factors had to be taken into consideration, namely, time (length of service) and combat based on length of overseas service, participation in battles and number of decorations received.

Innumerable other factors played a rather important part in the actual release of men from the service, the most important being shipping and the mission assigned the unit to which the individual or individuals were assigned. In an operation as large as this, there were bound to be modifications made in the light of experience, but the changes made did in no way modify the basic plan.

Due to the rapid pace of demobilization and the inability of selective service to furnish the necessary quantity of men, it was realized that if the rate of demobilization was not retarded, the army would consist of an inadequate number of volunteers. This retarding of the rate of demobilization in no way changed the overall plan.

Recruiting

Upon the capitulation of Japan, recruiting for the Regular Army was initiated. However, at that time, the existing law was in such shape that it was difficult to obtain enlistments. There were very few inducements, and the enlistment of men from civilian life was not authorized except in the case of those men who enlisted within fifteen days after their discharges. Public Law 190, 79th Congress, which was approved on 6 October 1945, gives us many additional emoluments.

Most of the men who have enlisted so far (May 1946) are, of course, army of the United States soldiers, and men who served during the war. However, about 120,000 have been original enlistments from civilian life with no prior service. Another significant fact is that fifty-three per cent of these enlistments have been for three years. It is

difficult for the general public to comprehend the fact that our manpower situation was extremely tight during the war, and that if the war had continued for another few months, we would have been in desperate need of new men.

The army sooner or later will be forced to depend upon recruiting alone, because there will be a time when compulsory service will be discontinued. Even if universal military training is adopted, it must be realized that that is not service—it is merely training, and the Regular Army will be called upon to train those men.

Conclusion

Following World War I, the American public believed they had fought a war to end all wars; this same feeling of security is not as yet prevalent in our thinking in the aftermath of World War II. This may be partially due to the shrinkage in the size of the globe, because of the tremendous strides made by transportation and communication. On the other hand, it may be due to a better appreciation of world conditions and the apparent misunderstanding in and between the nations of the world. The result, however, is that this nation as a whole is completely aware of the necessity for the continuation of strong security measures, namely, an Army and Navy of great potentialities.

The moral is that we will undoubtedly have an army of considerable strength and that in rebuilding and training it in personnel matters we must apply the lessons we have learned. We must not do as we did after World War I and forget our experiences during the years of peace. We must think and plan ahead, and there is no more important field for such planning than that of personnel management.

As late as 1937 we might have convinced the Axis gangsters of the complete futility of their preparations by simply matching our "cigarette money"—using the term figuratively—with expenditures on national security.

I sincerely believe that if we had given security its proper attention the Axis nations would not have started the war. Millions of men and women—Europeans, Asiatics and Americans—who perished in battle, or by disease, starvation and brutality in the past five years might be alive today had we faced the world in righteous strength instead of careless weakness. The enemy counted on us to go ahead with our pleasures, ignoring the threat to our lives and our very freedom. We proved them wrong but in the end it cost us a million casualties and astronomical sums of money to restore our security and rightful position in the world. Had we not had Allies to buy us time, our own efforts, great as they finally were, might easily have been too late.

General of the Army George C. Marshall

Teamwork for Defense

From the Graduation Address by the HON. W. STUART SYMINGTON, *Assistant Secretary of War for Air*, delivered 31 May 1946 at the Command and General Staff School.

IT is my understanding that this is the 27th class to graduate from the Command and General Staff School. A total of nearly 22,000 officers have graduated here. Today there are some sixteen countries represented. That is a magnificent record, for by this representation, plus air, ground, and service post-graduate training, the War Department is again following our President's desire for unification of military operations in the interest of greater efficiency and, therefore, in the interest of more returns on the taxpayer's dollar.

If you were not top men in your profession, you would not be graduating here today. You represent the first line executives in this vital, important business of national security. A successful business man is one who can produce the best product at the lowest price, and then let the world know about it. If our Army is to be a force for peace, you gentlemen must be successful business men in your career as officers.

Your partners in the last war were primarily the production men. In any war of the future, it appears that they will be primarily the scientists. With them, it will be up to you to create the best fighting force in the world. In the interest of the American taxpayer you must do it at the lowest possible cost. Also, you must let the world know that America is mighty in arms, and that your strength can preserve the peace against any future aggression.

You have partners who have proved themselves in their capabilities. American scientists, working as a team throughout World War II, gave us better weapons than our enemies had. We were surpassed in isolated instances. Germany was ahead of us at the war's end in certain fundamental fields of aerial research. I have always felt that it was interesting that at the time the war started, Germany was spending over seven times as much on aerial research as was the United States. But the fact remains that in the Army Air Forces our laminar-flow wing and many other developments were a large factor in the defeat of the Luftwaffe.

Our Mustangs and Thunderbolts shot down 157 of Germany's jet fighters while losing but ten of their own. While the German jets, with an endurance of forty-five minutes at most, were making a rather dubious combat record, we had in production a jet fighter, much faster, and twice as efficient.

It would take all morning to go down the list of American scientific achievements. The products of science were not, of course, restricted to aerial warfare. The weapons of all our branches are marked, in varying degree, with a stamp of the war-time laboratory. By winning the atomic bomb race our scientists, together with the British and Canadians, gave to the democracies a decisive weapon.

Your future partners in the business of national security will have what it takes. Granted the needed facilities and appropriations for research, they can be relied upon to do their part and more to keep America in front of the field. Will you gentlemen, the executives of the firm, pull your weight? I am certain you will, but to do so, you must be constantly alert. You must be commanders and staff officers of organizations that are constantly in fighting trim. Your units must be readily expendable. Above all, you must be a team, working together in smooth coordination, in common effort to achieve a common goal.

As an illustration of this team concept, let us consider the Normandy invasion in June 1944. In spite of the initial success, by the middle of July the situation on the ground was far from satisfactory. The British held the line along the Orne river at the eastern end of the Carentan Peninsula. The Americans had fanned out to the west and had bitten into the Cherbourg peninsula, but

the ground forces working inland came up against a type of terrain that put them farther and farther behind schedule:—the hedgerow country. As you know, some of you from first hand experience, this section of Normandy was made up of small fields, bordered with deep drainage ditches and stout, impenetrable hedges. The narrow roads were also hedge-lined. Each hedge had become a fortress, each field was bullet laced. The swollen stream of supplies and reinforcements which had flowed across the beachhead was dammed up behind the hedgerows. The British Second and the American First Armies were ashore. The IX Tactical Air Command had come in to cooperate with the First Army. The Third American Army was coming ashore and with it the XIX Tactical Air Command.

When the expansion of the Normandy beachhead came to a halt, most of us in America knew only what we read in the papers, but if we could have been given a look at the air-ground team play which was being set up in Normandy that July, we would have been more optimistic about an early victory.

The problem before the allied commander was clear. Smash a hole in the dam to let our power rush out over the plains of France. Once freedom of maneuver was secured, the defenders could be rolled up and the Allies would be on their way to Germany. To smash that hole in the dam, the Air Forces were called upon to perform an operation which had been performed successfully in Tunisia, but which had failed at Cassino:—carpet bombing. Carpet bombing, as you know, is a saturation attack which attempts to drop the greatest possible explosive load on the target area in the shortest possible period of time. It is a difficult operation because it requires close teamwork between the Ground Forces and the Air Forces.

The Normandy carpet bombing attack took place in the St. Lo—Periers area where the American VII Corps was in line. The 1st, 30th, 4th and 9th Infantry Divisions were ready to push into the vacuum left by the bombardment of a target area 7,000 yards deep by 200 yards wide. The operation—"Operation Cobra"—was carried out just about as planned. Fighter bombers began hitting the enemy from low level with bombs and machine-gun bullets. The fighters were followed by 1500 heavy bombers which filled the sky in a magnificent show of aerial strength. More fighter bombers followed the heavies, and as they completed their attacks, the medium bombers wound up the operation with both area and pin-point attacks. High overhead the Mustangs and Thunderbolts pounced upon any German attempt to interrupt the show.

The effect of this massive air blow on the enemy was devastating. A pall of smoke rose to 2,000 feet and covered the entire area. Enemy communications in the blasted area ceased, and their troops were badly shaken. Their casualties did not correspond to the scale of the aerial effort, but the essential task had been accomplished. The American Infantry advanced, breached the enemy positions west of St. Lo and shook the Third Army loose in the German backfield where it began a campaign which has had few parallels in history for speed and boldness. The enemy did not stand again successfully until France and Belgium had been liberated and the West Wall reached. "Operation Cobra" was a power play executed by an all-American air-ground team. It was smart, it was well-timed. Some tragic losses in American lives resulted from its inherent difficulties, but the basic lesson of the operation is further evidence of what can be done when everybody works together.

If our scientists can provide us with the best weapons in the world, and you graduates can prove that organization is the most effective manner possible of employing these weapons, what remains to make our armed forces a mighty force for peace? The answer to that is proper and sound advertising. We of the Army have a story to tell; it is an honest story; a true story, and a convincing story. America desires above all else, the success of international organization for the prevention of war. We know too, however, that we live in an unstable world which will

test the patience, skill, and the intelligence of our statesmen who strive for amicable settlement in the world's ills. We know that America listened to a strange story between World War I and World War II; namely, that you can avoid a war by being unprepared to fight one. All of us listened, and far too many of us believed it. We know now that this last war could probably have been prevented if the democracies had, in effect, gone to Munich, not only with a desire to avoid war, but also with the military ability to resist the demands of the fascist powers. The roots of war cannot be destroyed, however, merely by peaceful powers maintaining the strength necessary to prevent an overt act of aggression. Permanent peace must be a product of reason, compromise, and a willingness of nations to subordinate their own sovereignty to international order.

Perhaps it is fair to say that the world today is living in a sort of international feudalism. The federation will be a long and painful process. In the mean time, we must this time keep the peace, and the best assurance to that end is the maintenance of adequate military strength.

This is the story which must be told to the American people. This is the story which you all should quietly but effectively take from the camps and airfields into the towns and cities. The traditional arguments of the isolationists are easier to demolish than ever. Our barrier oceans to the east and west are no longer what they were before in the way of defense against aggression. The air weapons of today are capable of flying from bases in Northern Europe or Asia, and striking at any of America's industrial centers. It has only recently been released by General Spaatz that our new planes can go 10,000 miles and drop atomic bombs. In addition to that, as all know who studied the developments in Japan, even if they could not get back (and they can on that basis) it would be well to try to do it from the standpoint of what it would cost us to lose the bomber as against what the bomb would do in the way of destruction. Also, as you know, the development of the jet, primarily the ram jet, and the development of the V-2 Rocket have both given us one way operation where we don't have to worry about anything getting back. This war was won a few months ago, and already the weapons with which it was won are mostly, if not obsolete, obsolescent. You have had the good fortune to watch the P-80. We are crossing the speed of sound.

No one has long held a monopoly on any weapon of war. America would be foolish indeed, if we did not accept the fact that super bombers and atomic missiles will shortly become common property among the first class powers.

In summary, we must maintain a strong military force in being:—land, sea, and air. We must soberly accept the implications of the atomic bomb and not lose sight of the fact that in the last analysis, it is the man with the knife, whether or not he puts it on the end of a gun and calls it a bayonet, who imposes the will of the victor upon the vanquished. In other words, by means of land, sea, and air, in conjunction with production and science, we must this time maintain a balanced military establishment, and if our message gets through to America, we will have the people's support.

When you return to your duties, therefore, better equipped to serve as a result of your recent studies, think of yourselves, not only as soldiers, but also as public office holders, responsible to the government for business efficiency in the scope of your work. Remember that the scientists and the producers are your partners, and that they are hard hitting, influential operators who can help you attain your objective; that they are essential to your team; the team to preserve the United States. Remember that you have a story to tell America. Finally, remember that you must convince the people by work and action, of your ability to handle men, of your full consciousness that your public office is a public trust, of your earnest desire to be a true partner in that team of research, production and military operations which spells out strength for our national security.

Army Transportation, European Theater, 1945

LIEUTENANT COLONEL WILLIAM V. OWEN, *Coast Artillery Corps*
Instructor, Command and Staff College

LOGISTICAL plans for the support of the advance of our field armies into Germany were much upset by the enemy thrust in the Ardennes. Early in December, Third Army and Seventh Army were preparing to attack, break the Siegfried line and advance to the Rhine. The attack was to begin with the first favorable flying weather after mid-December. However, unfavorable weather persisted and Von Rundstedt took the opportunity to launch his attack in the Ardennes. Among the principal Allied countermoves to meet this heavy threat was an abrupt change in direction of attack for Third Army and a large increase in frontage for Seventh Army.

Prior to the execution of these countermeasures, the MSR (Main Supply Route) for Seventh Army was shaped like a dog-leg. From the Mediterranean the bulk of supplies traveled northerly through Continental Advance Section (Conad) to Lunéville, thence easterly to Saverne, and Haguenau. The readjustment of forces and boundaries was further complicated by the fact that Seventh Army was in Sixth Army Group, while Third Army was under Twelfth Army Group and was supplied by Adsec (Advance Section) through Channel Ports.

The readjustment of boundaries, supply routes, and depot areas was smoothly and quickly accomplished through G-4 conferences and transportation conferences between Third and Seventh Armies, and between Adsec and Conad.

At the turn of the year, the German high command knew that their Ardennes Salient had failed. In early January while they were extricating forces from the Bulge, they made repeated attacks on the widespread Seventh Army front. Their principal efforts were aimed at Sarrebourg, Phalsburg and Saverne with the intention of cutting off the Saverne gap and trapping Allied troops in the Haguenau area. On orders from Higher Headquarters, Seventh Army had pulled back all installations which were not highly mobile and thus presented only a fluid front for these Nazi attacks.

Some of these German attacks made deep penetrations. One of them got to Wingem only eleven miles from Saverne but as our troops "rolled with the punch," casualties were kept low and the enemy was unable to capture any worthwhile supplies or installations.

Transportation played an important part during all these maneuvers. First in moving back advance dumps, hospitals, and service units, and in shifting many infantry units from place to place back of the front to match the moves of the enemy. In addition to a number of truck companies attached to corps and divisions a separate pool of a hundred trucks was maintained well forward, and in constant touch with both Army and VI Corps Headquarters by phone and radio. These trucks had no supply missions but were kept on constant alert so that they could be dispatched to move troops to any part of the threatened front.

During this period, characterized by heavy troop moves, the demand for supply moves by truck had dropped off. Rail reconstruction and operation had caught up with the troop area. Rail terminals were within short-haul distances of army supply points so that the bulk of army transportation, not employed in troop moves, was used to shuttle old depots and dumps forward.

When the elimination of the Bulge was assured another large troop move took place. Seventh Army Forces, some of them recently released by Third Army, were moved across the service areas of both armies and into the French Area to take part in the final and successful assault on the Colmar Pocket. All the United States troops in the Colmar zone were maintained by reverse and lateral flow of supplies. During the month of February 1945, the effects of the "Battle of the Bulge" and the elimination of the Colmar Pocket were adjusted. All agencies from

Divisions to SHAEF were busily engaged in planning for the final offensive.

It was determined that Third Army would not revert to their original frontage but would attack from substantially the same positions they occupied after the elimination of the Bulge. Seventh Army's main effort was to be Sarreguemines—Homburg—Kaiserslautern—Worms—with a strong concurrent effort by VI Corps (of Seventh Army) in the old direction—Haguenau—Wissembourg—Landau, parallel to the Rhine and clearing the west bank of the River as it progressed.

In logistical preparation for these advances, rail operation was pushed up to within artillery range of enemy positions. Seventh Army railheads, depots and dumps were dispersed well forward and Conad took over all old depots in the Charms-Nancy area, those in Sarrebourg and Saverne and some of them in Lunéville. Conad then built up the Nancy area as its principal supply base for its part of the campaign in Germany.

Transportation Factors in the Logistical Estimates

Each army in Europe had a somewhat different problem to solve, but the basic elements were similar. The overall level of supplies on the continent was adequate in most categories, so the problem reduced itself largely to a problem in transportation. The principal factors were:

1. Location of end of rail.
2. Distance from line of contact to the Rhine.
3. Condition of railroads and highways, particularly bridges and tunnels, in the area of advance.
4. Estimated time required to put rail in operations to the Rhine.
5. Pipe line estimates.
6. Number of truck companies and average availability for Army.
7. Number of truck companies and average availability in Advance Section supporting each army.
8. What additional truck companies, if any, can be brought forward from theater control?
9. Time required for Rhine rail bridges.
10. As the advance progresses, what forces will be dropped off to police the area and protect lines of communications?

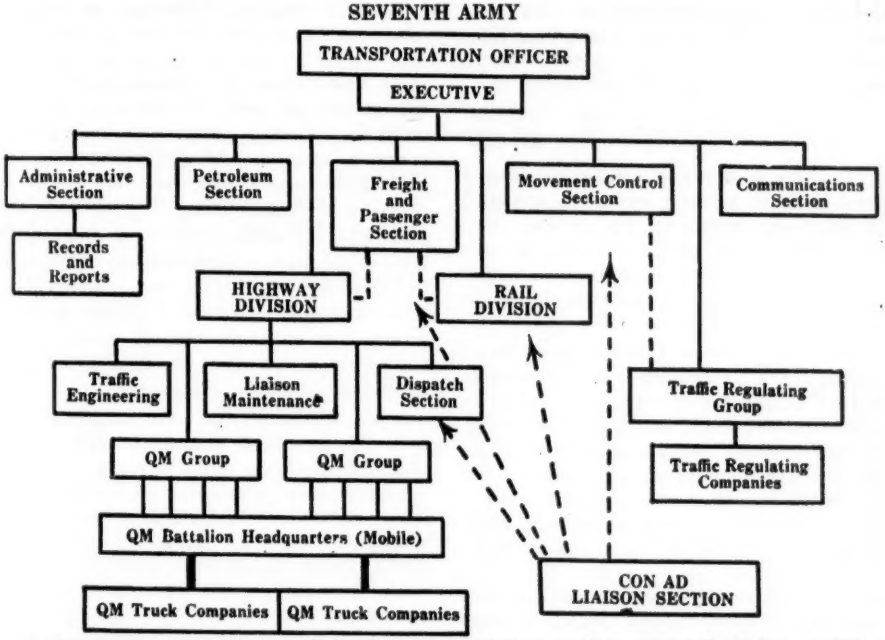
Problems and Planning Factors

Lines of Communications:—To supply this two-pronged advance, the main rail lines both from the south and from the Channel ports joined in the Blainville (SE of Nancy) yards. From Blainville one main line ran eastwards through Sarrebourg and Saverne, and another ran through Nancy, thence northeast to the border of Germany. East of Saverne, railheads were operating at Detwiler and Pfaffenhoffen, and work was being rushed to Haguenau. From Sarrebourg, a line runs north to the German Border at Sarreguemines. By February 1945, this network connected with Nancy and Metz. Any part of the front could now be supplied with items from any of the European ports of entry.

A key decision had to be reached before the basic plan for movement of Seventh Army supplies could be completed. What percentage of total requirements should be moved over each route? With Nancy as the principal supply point for Conad, the rail line through Chateau-Salines and Sarralbe to Sarreguemines was more direct. Some officials of MRS (Military Railway Service) and OCOT (Office Chief of Transportation) objected to construction of the Haguenau-Wissembourg line because it ran within artillery range of German positions on the east bank of the Rhine. The Rail Officer for Seventh Army was strongly backed by other transportation officers and Army G-4 in his contention that it would require the available capacity of both lines to supply Seventh Army, bring up bridging materials and handle miscellaneous demands such as hospital trains, troop movements and rail movement of tracked vehicles. Experience had shown that after construction forces had completed rail rehabilitation it took another week or more to approach operating capaci-

ty. New fills and bridges had to be shaken down, crews and dispatchers had to learn the idiosyncracies of the road. Captured equipment required careful handling. These lines could handle about ten trains per day in each direction and the trains averaged about 500 tons each (about thirty-five cars, fifteen tons each). Dependable water supply for locomotives was a problem as the watering facilities along the lines had all been damaged, and much of the motive power used excessive quantities of water due to the damage to French and captured locomotives inflicted by our Air Forces. It must be kept in mind that every personnel train, hospital train, construction train or mixed organizational train displaces about 500 tons of supply capacity.

It was decided to reconstruct and operate both lines. This provided increased normal capacity as well as a safety factor against the possibility that one line might be bombed in a vulnerable spot. There were many bridges and tunnels on these routes—most of them on the Sarreguemines-Kaiserslautern route. Initially about sixty-five per cent of total tonnage was to go by the inner route and thirty-five per cent by the Wissembourg route. This proportion was made to fit the distribution of troops rather than the capacity of the rail or highway. A portion of the rail capacity on the easterly route was allocated to First French Army.



A functional chart showing how the transportation section operated during period 5 Feb—VJ-day. It varies somewhat from the organizational chart on record.

In anticipation of the delay in putting railroads in operation after the breakthrough of the West Wall, it was decided to distribute army truck transportation facilities in about the same proportion. The Highway net coincided almost exactly with the railroads. One Quartermaster Group Headquarters would supervise transportation activities on the east flank and the other

Group Headquarters would stay close to Transportation Headquarters and Army CP for the move via Kaiserslautern.

Planning Factors:—From early December until the actual assault on 15 March, estimates of the number of divisions to be supported had fluctuated from ten to eighteen and finally stabilized to fourteen. In this logistical estimate, Seventh Army and Conad used maintenance tonnages which were based upon their own experience factors, slightly modified by European Theater data;

4 Armored	Divisions—400	tons/day	1600 tons
10 Infantry	Divisions—300	tons/day	3000 tons
	Total daily tonnage		4600 tons

These figures did not include such special items as heavy bridging materials, and other special heavy equipment. The division share was estimated at 25,000 tons, based upon total troops in advance of Army rear boundary—that is to say all Division, Corps and Army troops.

Availability:—Each Quartermaster Truck Company (TC) was estimated as having an average availability of thirty-four trucks on round-the-clock duty. Just before the jump-off all companies were operating efficiently with daily availability of forty or more. But experience had shown that shortly after a landing operation or a breakthrough, availability drops-off. Rough roads, flak splinters, rough by-passes, etc., increase flat tires, broken springs and general wear and tear. Long hours cause fatigue which in turn increases accidents. Ordnance maintenance units are overworked, and in a rapid advance they are out of service much of the time, moving and setting up new shops. No truck company can operate twenty-four hours a day without a driver augmentation team. With augmentation, good mechanics and skilled company and battalion supervision, a daily availability of forty can be maintained for long periods. For planning purposes, however, and in consideration of wide variation in experiences, driver ability, unpredictable conditions, etc., it is advisable to use thirty-four trucks as the average availability per company.

Ton-Mile Capacity:—Though the theater commander had authorized 100 per cent overload for all 2½ ton 6x6 trucks, a long term check showed that the average load carried was about four tons. Trailers were not normally used as cargo carriers. On long convoy operation in areas where refueling facilities are scarce, these trailers are very useful in carrying extra gasoline.

It was estimated that each operational truck could make a forward move of seventy-five miles and return each twenty-four hours. These estimates allow for a quickly handled return load on about half of the trucks—but no detours or long side trips to pick up or dispose of the return loads.

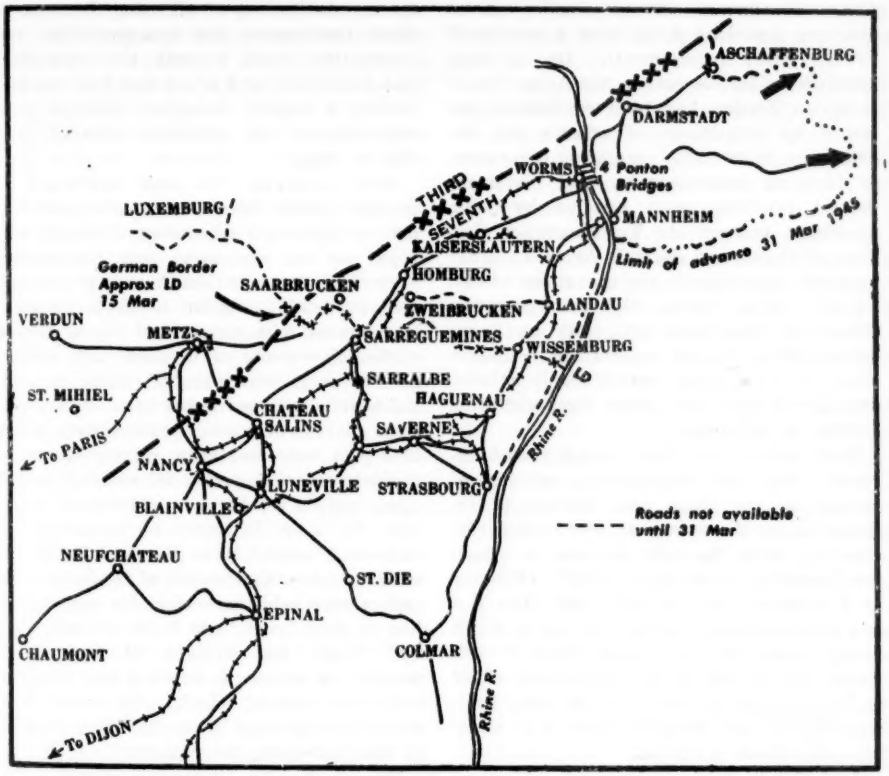
It was estimated that an average advance from existing depots and rail transfer points of about fifty miles could be made by Conad (using a large proportion of 10-ton semi-trailer units) and that the seventy-five mile additional move by army transportation would support all elements of Seventh Army to the west bank of the Rhine between Ludwigshaven and Worms. The estimates for both Army and Conad were substantially improved upon many occasions but could not be guaranteed when moving into a new territory.

Truck Companies Required:—To transport the 4,600 tons beyond end of rail or Conad Truckheads required:

$$\frac{\text{4,600 tons}}{\text{34 trucks per company} \times \text{4 tons per truck}} = 34 \text{ companies}$$

Other Army requirements:

Attached to each Armored Division	2 companies/ division	(× 4 divisions)	= 8 companies
Each Corps	1 company/ corps	(× 3 corps)	= 3 companies
Reserve for special troop moves, hospitals, mail, operation of railheads and dumps			6 companies
Total companies required			51



Calculations were made and presented for supporting the advance at greater distance beyond end of rail. Related studies were made by Conad, but the total number of truck companies required so far exceeded the maximum available that the plans were abandoned.

When the initial computations were made Army had thirty-one truck companies assigned and attached, seven of these were attached to corps and divisions. In addition the QM POL (petrol, oil, lubricants) section operated one QM Truck Company (Petroleum) which was constantly employed in shuttling tank trucks from end-of-pipeline to forward Class III truckheads.

Request was made on the office of the Chief of Transportation ETOUSA for additional truck companies, a proportionate number of QM battalion headquarters, mobile, and for two QM group headquarters to relieve the Army Transportation Officer of most of the details of administering eight or more truck battalions. Along with this request for additional cargo carrying units, a request was made for additional traffic regulating personnel.

The additional transportation units were furnished by the Chief of Transportation through the XYZ plan. Under this plan transportation facilities from all sources were allocated to the armies and advance sections in proportion to the urgency of their needs and the latest priorities.

Movement Control:—No formal regulating station was established to serve Seventh

Army. Continental Advance Section served only one American Army plus a portion of French Army requirements. On the long drive up the Mediterranean, the Army Transportation Section had been continually enlarged by attachment of officers and enlisted men from traffic regulating companies, so that all transportation and movement control problems were handled by joint agreement between the Transportation Sections of Conad and Seventh Army. In order to match more closely the operations within Twelfth Army Group, the Transportation Officer of Conad was designated as Regulating Officer. Conad maintained a liaison officer of field grade and a small enlisted detachment with the Army Transportation Section at all times.

Each service in Army requisitioned directly upon the corresponding section of Conad; at the same time furnishing information to the transportation section. On occasion, when the total demand on Conad was beyond all capabilities, a POM (Priority of Movement) meeting was held. The G-4 and transportation representatives of Sixth Army Group, Seventh Army, First French Army, Conad and ACOT (Assistant Chief of Transportation) met with Military Railway Service and Pipeline Officers to draw up a movement program.

Each Service made oral or written demand upon the Freight and Passenger section, Army Transportation, for forward movement of all supplies after arrival in the Army area. Where such requests were within the capabilities of available transportation it was routine. The necessary Transportation Order (TO) was written and the Dispatch Section ordered the movement by one of the Truck Battalions (or through a QM group headquarters after they had been established). Where the sum of the demands upon transportation exceeded their capability, the services were so notified and asked to reduce their demands to a quantity which could be handled. Where such compromise tonnages were not satisfactory to any using service, Army G-4 would either establish priorities or call a conference of the representatives of all using Services. At these conferences the transportation representative would present the capabilities and limitations and a solution was reached. During a rapidly changing situation these commitments and priorities changed from day to day.

Over most of the area traversed by Seventh Army there was an adequate road net, so that rigid scheduling of supply convoys was not necessary; only routes were prescribed. Organizational moves were scheduled in detail in order to avoid excessive interference with supply and administrative traffic. Movements of divisions and smaller combat units were usually routed to avoid the heavily traveled Depot area. Where possible, convoys of tracked vehicles were scheduled past congested areas during the hours of darkness with special TC and MP guides. Army supply trucks were supervised in convoys for long distances, or by four-truck sections or single trucks for short hauls. The officers and section leaders of the truck companies were held responsible for road discipline of their trucks and TCPs (Traffic Control Posts) and Freight Dispatch teams verified the origin, destination and cargo of such army supply vehicles. An overall road patrol was operated by the Highway Division of the Transportation Section.

Where a division or other unit was to make an administrative move by a combination of rail and highway, the organization and movements officer of Army G-3 office would notify the Transportation Executive or Movements Section, direct, that the specified unit was to move from here to there and that it was desirable to move all tracked vehicles plus certain other elements by rail and the balance by road. The G-3 office would give the approximate time and date that the unit would be ready to move. Then the movements officer would work with the Rail Section and MRS to determine how much could be moved by rail; designate the loading points, and determine when rail cars would be spotted. He would also select the route or routes for the highway move, the number of serials and the time of departure for each. The move-

ments officer would usually notify G-3 as soon as preliminary information was available so that G-3 could publish the order to the unit. Such an order gave very little detail, as follows:

"XXX move from _____ to _____ by road and rail; movement to begin at about _____ hour on _____ date.

"Obtain movement instructions and coordinate all details with the Seventh Army Transportation officer at _____ place; Phone _____ XXX."

This last short paragraph placed responsibility on the unit commander for obtaining road clearance, etc., from the Transportation Officer and it also made the Transportation Section responsible for expediting the movement of the unit.

In many cases where rail was not available, the transportation section had an additional job of furnishing trucks to motorize some elements of the unit.

Attack on the Siegfried Line:—The overall plan of operation was not to push the enemy back across the Rhine but to defeat the German forces west of the river. To accomplish this mission better, Seventh Army did not jump-off until Third Army had an opportunity to exploit their gains north of the Moselle and start their drive southward. On 15 March 1945, Seventh Army attacked all along its front. In four days the Siegfried defenses in depth had been penetrated and on the fifth day exploitation and rapid pursuit were in progress in two principal areas: Sarrebrucken to Zweibrucken and in the narrow gap at Wissembourg. No unusual traffic or supply problems were encountered at the Wissembourg gap, but Homburg became a serious bottleneck on the principal MSR.

Traffic Control:—Measures for control of traffic on the MSR through Homburg for the first three days after the breakthrough were inadequate. Vehicles were backed up for miles, and the average miles in the hour (MIH) fell below ten. Many factors contributed to this situation:

1. The number of vehicles exceeded the capacity of the roads.

2. The rear elements of divisions and corps were moving up at the same time as the advance elements of all army installations and basic supplies.

3. Enemy forces had not been completely mopped-up in the woods and hills, so all secondary roads were avoided by administrative and supply convoys. Traffic canalized at Homburg for the only main road to Kaiserslautern.

4. MPs were not familiar with the locale. There was a rapid change of personnel at MP posts. As divisions moved forward, corps MPs took over and were quickly relieved by army MPs, and these were sometimes changed before they could become familiar with the local problems.

5. While the daytime load greatly exceeded the highway capacity, it was found that movement between midnight and dawn often dropped to twenty-five per cent capacity.

6. Communications were so poor that intelligence of traffic congestion could not be communicated from forward TCPs to Transportation Headquarters with sufficient speed.

Corrective Measures:—(1) Traffic engineers made a study of constricted spots on the most heavily traveled route from Sarreguemines through Homburg to Kaiserslautern and made recommendations to the Army engineers. By-passes were improved and bomb damaged areas in towns widened.

(2) Cub planes were used to fly over the routes and observe the density of traffic at various locations. As a result, additional traffic control posts and MP stations were established and a route was designated for returning empty vehicles. In some of the towns such vehicles as gasoline trucks, tanks, tank transporters and heavy engineer equipment could not pass, this required rigid control of alternating one-way operation and/or separate return routes.

(3) To compensate in some degree for the frequent changes in MP personnel, all TCPs established by the Transportation Section were manned by the same personnel as long as Army operated in the area, and advance observers from Conad were broken-in before the post was abandoned by Army.

These improved measures, aided by a re-

duction in total traffic, produced a reasonably smooth flow of traffic after three days. The number of vehicles through Kaiserslautern was nearly equal to that at Homburg, but adequate route marking, TCPs and MPs kept the traffic moving, and the proportion of night traffic was increased.

The Rhine Crossing

The crossing of the Rhine was made considerably in advance of predictions. Transportation and all echelons of supply had to extend every capability to support exploitation across the Rhine. It had been expected that some supply build-up would be made near the west bank of the Rhine before a crossing was effected.

The assault crossing was made early on 26 March by the 3d and 45th Divisions. At the end of twenty-six hours, four one-way class 40 bridges were in operation, two heavy ponton bridges and two floating treadway bridges. Traffic control planned by XV Corps G-4 was supervised by the assault divisions until they cleared. Corps assumed control during the day on the 27th, and Army Transportation Section took over control after 2400 on the 28th. XV Corps, heavily reinforced to a total of 23,000 vehicles and 120,000 troops, had crossed the Rhine in sixty-eight hours. During this period evacuations and return cargos were handled by DUKWs and ferries and westbound vehicles were held in assembly areas until they could cross with minimum interference to forward movement.

Army carried on with no basic changes in over-all control. The volume of return traffic increased from day to day until one bridge was designated exclusively for westbound traffic and another was alternated when required.

Army supply truckheads were established east of the Rhine in order to eliminate the need for division or corps vehicles to cross the west bank. Control points were established on the east bank to prevent return of non-essential traffic, and unauthorized vehicles were impounded.

Another measure used to reduce bridge traffic was to move a complete ammunition dump of 8,000 tons and thousands of tons of rations and gasoline to army supply points many miles east of the river by use of DUKWs.

On the last day of March, sixteen days after the assault began, Seventh Army troops had crossed the Rhine in force and were fanned-out on a front 200 miles from their line of departure. Mannheim had fallen and the Neckar and Main rivers had been crossed in many places. Aschaffenburg to the northeast was holding out, but elsewhere spearheads were moving towards Schweinfurt and Wurzburg. VI Corps had substantially completed their mopping-up of the wooded pockets in the mountains, and the west bank of the Rhine was entirely clear in preparation for their crossing in the Mannheim area where an additional bridge had been erected. XXI Corps had coordinated with Third Army in mopping-up pockets north of the MSR, and substantial forces had crossed over after XV Corps.

Observations:—The planning factors indicated that under the existing circumstances troops could be supported only 125 miles beyond end-of-rail. By close cooperation between Com Zone and Army, transportation results can be improved. Each problem was solved jointly, and all commitments were allocated to the transportation section most capable of handling the particular loads at that time. Army trucks and Conad trucks worked side by side on many projects.

As the advance progressed across the Rhine, divisions and army installations dropped-off to operate or guard establishments and areas, so that the number of troops in the forward area dropped to little more than half of army strength, but this saving in demand on transportation was more than offset by the hundreds of thousands of displaced persons, released allied prisoners and German prisoners that had to be fed, cared for and/or moved.

Engineers and MRS pushed rail repairs and reconstruction with remarkable speed, but the advance was so rapid that the forward troops were 200 miles or more in advance of rail at all times up to VE-day.

Technique and Procedure Adopted by the 106th Division in Guarding Prisoners of War

MAJOR GENERAL D. A. STROH, *United States Army*
Former Commanding General, 106th Infantry Division

This article supplements the article "Guarding Prisoners of War in Germany" which appeared in the September issue of the MILITARY REVIEW.—THE EDITOR.

Staff Organization

WITH the exception of ten officers, loaned to the Division by Advance Section, Com Z about the middle of May, the normal division staff functioned without augmentation, except for personnel drawn from organic or attached elements, during the entire period. The borrowed officers—rail transportation officers, graves registration officer, quartermaster, and medical supply officer—were of great assistance.

The regular staff, however, would normally have found themselves sufficiently involved in administering a division of approximately 40,000 officers and men deployed on a front of 340 miles and a depth of 600 miles, without the added burden of nearly a million prisoners of war. Such, however, was the task confronting it.

Little change in the organization or normal functions of the various staff sections was found necessary or desirable. Members thereof were found to be sufficiently trained to handle the excessive added load, and events proved that a normal division staff, except in numbers, was admirably adapted to the task.

The G-5 Section, having virtually no normal duties to perform, was transposed into a sub-section under G-1, augmented in numbers, and charged directly with the administration of prisoners of war. Among its many duties was the issuing of a series of so-called Prisoner of War Temporary Enclosure Memoranda, which formed the "bible," so to speak, for the guidance of enclosure and area commanders. These were compiled from many sources, and combined official instructions from higher headquarters, telephone conversations dealing with policy, and other scraps of information as they were issued and became available. This sub-section likewise received daily prisoner personnel reports from area commanders, and reported to higher headquarters the daily totals in confinement and losses for all reasons.

Screening and Segregation

G-2 naturally was charged with this far-reaching activity. The section was assisted by a number of IPW (Interrogation of Prisoners of War) teams, one of each being stationed eventually at each enclosure.

Initial orders from higher headquarters directed that screening be accomplished in three steps. The first step was designed to discover the presence of civilians, including displaced persons. The second step resulted in the segregation of special nationals, officers, noncommissioned officers, rabid Nazis and potential trouble-makers (members of the Luftwaffe, SS and Panzer units, submarine crews and Gestapo), protected personnel (medical personnel and chaplains), and men with such special skills as radio operators and diesel engine mechanics. The third screening was to be conducted by representatives of foreign governments.

It was estimated that normal division G-2 personnel would be able to screen approximately 20,000 prisoners per day. While this proved to be an ambitious estimate, the speed of screening and segregation was really limited by the availability of compartments within the enclosures. Manifestly there would be no advantage to physical segregation if the means were not available to keep the groups separate after segregation had been completed. Furthermore the compartment fences must be of a type which would prevent physical mixing of the various groups, since the guard personnel were

not sufficiently numerous to warrant guarding anything but the perimeter wire surrounding the main enclosure.

It will be noted that the initial screening steps resulted in the segregation of at least sixteen groups within each enclosure. Not less than sixteen compartments were thus required in each. As additional segregation took place, for separation into kreis and occupational groups preparatory to discharge and other evacuation, the number of groups rose to the hundreds. A large number of compartments was required, as well as a high degree of ingenuity and improvisation on the part of enclosure commanders to keep the groups separate and readily available for processing.

Screening and segregation started slowly, but picked up speed with experience. The almost total lack, initially, of inner compartments and failure to receive more than two additional IPW teams made the progress almost hopeless for a week or two, but the task was about twenty-five per cent complete by 11 May, and eighty-five per cent complete ten days later.

During screening operations many individuals were found to be of counterintelligence interest. The mission of the organic division CIC detachment was to make certain that such individuals, who were in the war criminal or automatic arrest categories, would not be released. To assist in uncovering such personnel, informer systems were established in all enclosures with the mission of ferreting out and reporting their presence.

Supply

The Division led a hand-to-mouth existence during the early part of the period because of the extreme difficulty of securing and transporting the vast quantity of rations, fuel, medical supplies and cooking facilities required by nearly a million prisoners of war.

Facilities of ComZ were taxed to the utmost, particularly prior to 7 May, to maintain the flow of essential supplies to five field armies plunging forward east of the Rhine. While the situation eased perceptibly after the shooting war stopped, the demands for supplies of all sorts were still enormous. Adsec was granted authority to draw on captured enemy stocks, but found that most of these were located within army areas and had been appropriated by those units. During the critical ten days or two weeks which elapsed between assumption of control of the situation by the 106th Division and VE-day the Division, to a very large extent, was on its own to accumulate the bare essentials. Employing its own transportation, for a time almost without augmentation, its supply personnel ranged far and wide through the Rhine Valley and beyond to collect those supplies without which the prisoners could not exist. In the first ten days of May 322 tons of Class II German quartermaster material alone were collected in the Frankfurt and Darmstadt areas and transported by division quartermaster trucks. As the situation became stabilized the picture brightened.

At an early conference, late in April, it was agreed that essential supplies should be laid down at conveniently located railheads in each of the four division areas, and transported thence by division transportation to the enclosures. Not less than three days' and preferably five days' supply was to be maintained at railheads. An exception to the general rule was the supply of wood and coal for cooking purposes. Because of the tonnage involved (about 400 tons per day), it was expected that ComZ would deliver such supplies within hand carry distance of each enclosure.

Since organic division transportation was manifestly inadequate for the job, a total of 135 additional 2½-ton trucks were promised on 29 April. A week later only seventy-five of these had been received, thus putting a terrific strain on organic transportation, already stretched to the breaking point in an effort to supply more than 30,000 American troops in the Rhine Valley assigned and attached to the Division.

The supply of rations to the prisoners constituted perhaps the most serious prob-

lem. Most prisoners had arrived without individual cooking equipment. Heavy equipment for community cooking was almost completely absent. Division agencies discovered and transported to the enclosures a large number of 200 gallon boilers, each capable of feeding 1000 men. Unfortunately most of these were designed to operate with electricity or oil, and had to be adapted for coal and wood. Sufficient numbers were never obtained. All sorts of improvisations were employed. Empty oil drums were employed for cooking purposes. At one enclosure an old locomotive was run in on an improvised track to furnish steam for the cooking boilers.

Under such circumstances it was essential that rations be delivered of a type which could be consumed without cooking until such time as adequate cooking facilities could be made available. "B" rations, although delivered on 27 April to the Blue area, were not of this category for all components. Neither were the prescribed special POW rations, later made available. These contained such inedible components as flour and lard. During the most critical phase of the operation authority was received to issue only those components of the ration which could be consumed without cooking, including such items as raw potatoes. This procedure naturally led rapidly to the accumulation of badly balanced stock at all distributing points. Unconsumed portions were gradually absorbed as additional cooking facilities were discovered or constructed. Numerous German civilian bakeries in the area were forced to bake bread from appropriate components of the ration for the consumption by the prisoners. By these and other desperate measures the situation was gradually brought under control.

But the supply situation was in general precarious for many weeks. As of 11 May only one day of rations was on hand at distributing points, and less than one day at each enclosure. A week later the situation was much improved in the Red and White areas but was still bad in Blue. As of 19 May the Blue area was still short 175 large cooking boilers. The fuel situation was likewise unsatisfactory in this area as late as 25 May. Such comparative luxuries as mess gear washing facilities were estimated on that date to be but fifteen per cent complete. Lack of clothing for prisoners was beginning to be felt about the same time.

Medical Service

One of the most serious situations confronting the division when it assumed responsibility in the last week of April was the need for medical attention among the prisoners. It has been mentioned that 10,000 were on sick report at a single enclosure. While this was perhaps the most extreme case, the general situation was extremely bad. Dysentery was perhaps the most prevalent ailment, not ameliorated by the presence of slit trenches, and the absence of mess sterilization facilities.

The division had immediately available only its organic medical battalion, and a stock of medical supplies suitable for a division of normal size. It was immediately confronted with the necessity of not only serving a division nearly three times normal, but also for the provision of medical attention to the vast prisoner population. The situation called for heroic measures.

Seven medical teams, each consisting of two officers of the Medical Corps, one of the Medical Administrative Corps, and ten enlisted men of the Medical Department were made available from the medical battalion, one for each of the seven enclosures initially taken over by the division. These teams were duplicated several weeks later by personnel furnished by ComZ at each of the nine other enclosures. It was the duty of each team to organize medical personnel from among the prisoners themselves to handle dispensary service within each enclosure, and to arrange for evacuation of the more seriously sick. The senior medical officer at each enclosure, whether he belonged to such teams, to the medical section of the battalion guarding the camp, or to the field hospital detachment which was later located there, acted as surgeon of the enclosure. The division surgeon

supervised the entire medical service throughout the division area. Infirmaries, each servicing 5000 prisoners, and consisting of a dispensary and 25-bed hospital and staffed by two or three German medical officers and twelve German enlisted medical men, were set up at each enclosure in the necessary numbers. Special medical centers, each accommodating from 100 to 500 patients were set up to serve the more severe cases. Civilian German nurses and nurses' aides were obtained through the German Red Cross.

Service within the enclosures was severly handicapped for weeks due to the almost total lack of medical supplies, tentage, blankets, and litters, except those which were made available from the limited resources of the division, or which could be found elsewhere in the area. It was not until about the middle of May that this phase of the picture began to take on a brighter hue. By that time all or parts of the 9th, 12th, 50th, 61st, and 78th Field Hospitals, attached to the division, were operating in the area, with detachments at each enclosure. Tents, blankets, and litters had been accumulated to permit temporary hospital facilities, within, or adjacent to the enclosures, to be established at each, sufficient to accommodate a minimum of three per cent of the prisoner population. These were all the responsibility of the division, and proved to be adequate to handle the load. At the peak of operations a total of more than 23,000 infirmary beds were being maintained within enclosures, in addition to 16,000 additional beds being operated by the attached field hospitals.

It had been agreed that the division would also be responsible for the evacuation of the sick from enclosures providing that the necessary number of ambulances was attached, and that bed credits were made available in general or similar hospitals.

By 11 May only fifty additional ambulances had been made available for this purpose, and these were not under division control. Two German hospitals, and the American 77th Evacuation Hospital had been designated to receive evacuees. These were, respectively, 120 and forty miles round trip from the enclosures. Furthermore all were so badly overcrowded for a considerable period that the sick had to be transported to points beyond, or returned to the enclosures. The number of ambulances proving completely inadequate for the purpose, evacuation for a time had to be accomplished in cargo trucks, placing an additional load on this type of transportation.

Eventually a complete ambulance battalion, the 428th, of a headquarters and four companies, the usual complement of a field army, was attached to the division. One company served each area. Thus reinforced, the medical situation was gradually brought under control to such an extent that the sick rate among the prisoners was lower, in the last weeks of the operation, than that for a comparable age group in the United States.

A few statistics will be of interest. The 331st Medical Battalion (division organic), in addition to providing the usual medical service for a division of 40,000 on an extremely extended front, supervised medical service for the prisoners and handled, during May and June, nearly one and three quarters million men on sick call, of whom more than 41,000 were evacuated. During such evacuation, organic and attached ambulances covered nearly 200,000 miles.

Engineer Activities

The 106th Infantry Division began its prisoner of war assignment with its organic engineer battalion, the 81st at practically full strength in personnel and matériel. It was decided, with the concurrence of higher headquarters, that the entire battalion would not be considered as available for guarding prisoners, but would be employed wholly for technical purposes, principally to reconnoiter for materials, to organize prisoner labor and to supervise their work in completing the construction, improvement, and repair of the enclosures. Accordingly, one company was stationed in each of the Red, White and Blue areas in support of the guard troops stationed therein.

Com Z announced the following priorities for the construction of enclosures:

1. One perimeter barbed wire fence.
2. Second perimeter barbed wire fence, with a ten-foot lane between the two fences, filled loosely with concertina wire.
3. Box latrines.
4. Guard towers.
5. Access road (no interior roads).
6. Kitchen and food storage shelter. One water tap per kitchen for drinking and cooking water.
7. Perimeter fence lighting.
8. Ablution water.

The original conception was that the first four of these priorities would be completed by general service engineers, working under Com Z control, before the enclosure was occupied by prisoners. This was further extended to include the construction of inner compartment fences, and piped water supply adequate for drinking and cooking purposes, estimated at one gallon per man per day. The last four priorities were to be completed by prisoner labor, with or without assistance of Com Z engineers, depending upon their availability.

None of the enclosures was complete to include the first four priorities, as amended, when the division assumed control, and some weeks were to elapse before the situation was brought under control. The water situation was particularly serious. One of the largest enclosures, requiring a minimum of 150,000 gallons per day was being supplied with water in 5-gallon cans. The difficulty of the undertaking, considering the almost total lack of interior roads, can be imagined. All sorts of improvised methods were employed, including the use of fire hose and empty wine casks of large capacity. A minimum of one outlet for piped water for each 200 prisoners was considered suitable. As late as 19 May the number of outlets which had been made available averaged one per 1250 prisoners. It was not until about 1 June that the drinking water situation had been solved completely.

It was found that lighting of the perimeter fence made possible a reduction of sixty percent of the guard personnel necessary for reasonable security. Some progress along this line was made, largely by the employment of improvised means, collected by Division agencies.

A double perimeter fence was essential, since the wire on a single fence could be separated with ease, and escape tunneling was readily possible through the generally soft soil. The construction of double fences progressed slowly, and was complete about the second week in May. The necessary guard towers at all enclosures were completed at about the same time. Difficulty of screening and segregation, without the means of enforcing segregation thereafter, has already been described. Construction of the necessary compartment fences was finally completed by 20 May.

The remainder of the period was devoted to improvement of the enclosure, including the construction of interior roads, kitchen and hospital shelter, and provisions for discharge processing establishments.

In addition to a multitude of other services the division engineer battalion, during May and June alone, constructed more than twenty-eight miles of access and interior roads, and more than sixty-five miles of barbed wire fence.

Transportation

Except in the Green area, where the large proportion of organic motor transportation to the relatively small prisoner population made the problem comparatively simple, the lack of cargo trucks in adequate numbers throughout almost the entire period constituted a serious detriment to efficient operation. The organic transportation of the division was of course wholly inadequate for the task. The equivalent of three truck companies, the organic transportation of the provisional guard battalion attached to the division, was made available in driblets. Eventually a total of 135 trucks from this source, of 2½-ton capacity, were distributed between the Red, White and Blue areas in accordance with their needs. The 339th Quartermaster Truck Company was attached to the division on 1 June. Three weeks later

a total of fifty 10-ton semitrailers arrived. It has already been mentioned that an entire ambulance battalion was attached. With this transportation employed day and night, seven days a week, it was possible to haul most supplies from railheads to enclosures, to evacuate the sick, to transfer prisoners between enclosures and areas, to deliver discharged prisoners to their home *Kreise* over most of the American occupied zone, to haul prisoners between entraining points and the enclosures, and, by no means least, to keep the reinforced division itself supplied. The maintenance problem was terrific, and the strain on operating personnel very severe.

Rail transportation also constituted a continuous headache. The attached rail transportation officer on the division staff, working through similar officers representing Com Z at the various entraining points, coordinated all requirements for rail transportation for evacuation to the west, for transfers between areas, and for the transportation of dischargees to the east. Army requirements had a priority over those of the division, and many trains were canceled at inopportune times. Shortage of box cars for westbound shipments began to be felt as early as 19 May. Little improvement had been made in the general rail situation as late as 9 June, when some 50,000 prisoners were awaiting shipment, but by 23 June considerable improvement had been noted, and from that date the situation remained satisfactory.

Communications

The task of maintaining communications between the division command post, the headquarters of Adsec and Conad, the command post of the Fifteenth United States Army, each of the four area headquarters, and the organic elements of the division in training at Rennes and later near Mayen, considering the tremendous distances involved, was unparalleled as a division communication problem. The division command post was moved from Stromberg to Bad Ems on 4 May for the purpose of placing it in a more central location with respect to all subordinate and superior headquarters.

Radio communication with all major headquarters was maintained throughout the period. Liaison officers were exchanged freely with all headquarters. Wire communication, using commercial circuits, was established with Army, Adsec, and the Red, White and Blue areas after many damaged cables had been repaired by division personnel. Efforts to secure similar communications with Conad and Green were never successful. A motor courier service was maintained once daily between the division and Adsec, each headquarters alternating in the runs, and between the division and each principal subordinate headquarters. The artillery liaison planes were based at Bad Ems, and flew daily messenger service, weather permitting, to Green, and elsewhere as requested. As illustrative of the magnitude of the task, the 106 Division Signal Company, during May and June, constructed 1144 miles of wire. During the same period motor messengers covered in excess of 52,000 miles, and airplane couriers in excess of 43,000 miles.

A mission which began merely with the simple statement of "guarding prisoners of war in Germany" thus had gradually expanded to the point where mere guarding was the simplest portion of the job. The mission came to include administering, screening, segregating, transferring, evacuating, processing, discharging, and transporting prisoners of war all over France and Germany. It was perhaps fitting that the 106th Infantry Division, which lost so heavily to the Germans in December, should be given the assignment in April of guarding a greater number of German prisoners than has ever fallen to the lot of such a unit,—a number said to be fifteen times as large as the entire number captured by the AEF in World War I.

Artillery Divisions

MAJOR WILLIAM F. CATHRAE, *Field Artillery*

IT is generally admitted that the non-divisional artillery units "did their bit," and perhaps even a bit more, during the recent war. It is now generally admitted, also, that these units encountered more than their share of administrative grief because of a loose administrative control above the battalion level. Several boards of officers have made complete studies of the subject and have submitted recommendations ranging from the retention of the present setup of separate units to the organization of our non-divisional artillery units into divisions patterned after infantry divisions and composed of combined arms and services. Now is the time for us to look into our deficiencies and to take remedial action before the hard-learned lessons of the recent war are lost in the archives of our Service Schools.

Why is there the need to revise a system which performed so well during the war? The reason is that while the organization of the artillery *did* work tactically, it was administratively unsatisfactory. With the experience we have gained, we should now be able to eliminate some of our administrative difficulties and still retain our proven tactical ability.

To understand our problem better we should trace the history of our artillery since the end of World War I. During the years of peace, the infantry and the artillery grew further and further apart. The undesirable features of this were recognized by both infantry and artillery officers, and this realization led to the combat team formation, with the divisional artillery working hand-in-glove with the infantry. During the maneuvers of 1940 and 41 the combat team formation was thought to be the answer to all problems of tactical employment of the supported and supporting arms. The combat team was controlled administratively by the division headquarters staff. This headquarters was in very close touch with the combat teams and the tactical administrative control was a direct chain of command.

In the employment of his troops the corps commander was concerned primarily with his infantry divisions which were, as we have seen, composed of combat teams. The corps artillery (one field artillery brigade organic to each corps as authorized prior to 1943) was thought to have a very small place in our modern army of combat teams—each combat team being a self-sufficient, hard-hitting unit within itself. The tactical employment of the artillery was changed somewhat when the division artillery commander found that he was unable to mass the fires of his divisional artillery onto such particularly lucrative targets as presented themselves. This did not change the administrative control of the artillery. Division headquarters was still very much in control of the divisional artillery, so all through the war the divisional artillery was supervised by a direct chain of command both tactically and administratively.

The corps artillery did not fare quite so well. The artillery brigade organic to each corps was supposed to be a tactical unit only, but when the brigade entered into combat it became necessary for the commander to assume the administrative, as well as the tactical control of its field artillery regiments. As the war in North Africa progressed, we realized that more and more artillery was needed to counter tank attacks and to provide sufficient counterbattery fire. Additional artillery units were attached to the brigade, and the brigade was able to handle these additional units with little difficulty. With the brigade and regimental organization we were able to provide a large degree of flexibility in the employment of the artillery and at the same time retain administrative control of its units.

Later in the war (October 1943), we went "all-out" for the organization of our non-divisional artillery into separate battalions, separate group headquarters and separate brigade headquarters; these headquarters were for tactical control only. The units were assigned to the various armies as needed and,

in turn, attached to the various corps within the army. The reason for forming all of these separate units was to allow a greater flexibility in the employment of our artillery. Under this organization we could attach a number of artillery battalions to a headquarters, the amount and caliber depending upon the mission to be accomplished. Flexibility is a very desirable asset, but at present there is a lack of administrative organization and control.

We were blessed that our tactical employment *did* work out very satisfactorily, but administratively the problem is still with us—and it is still unsatisfactory. Twenty or more separate artillery battalions dealing directly with the army quartermaster, the adjutant general, the G-1 and the other staff officers of the army headquarters adds a tremendous amount of administrative chaff to an otherwise well-organized headquarters. Furthermore, the battalions were uncontrolled and unsupervised administratively, which was detrimental to both the army and the battalions, particularly the latter.

The War Department realized this situation and WD Circular 439, 14 November 1944, was a step towards closing the large administrative gap that existed between the non-divisional artillery and their army headquarters. The circular stated that whenever practicable, continuity of command would be encouraged by "the retention of assignment of battalions to groups." This acknowledged the fact that the separate battalions were alone in the world, and at first glance it appeared that the regimental system was being restored. This was not the case, as there was no permanent assignment of battalions to groups. In practice, tactical considerations were paramount and the battalions were shifted from group to group. The changing of battalions every week or so did not permit stable administration by a group headquarters. So the war ended with the separate artillery battalion still floundering around in the morass of multitudinous administrative details with very little supervision, control or help from anyone.

A board of officers made the following report of the administrative operations of separate field artillery units shortly after the cessation of hostilities of World War II.

"Lack of an administrative headquarters had a deleterious effect on morale, supply and personnel in general. For this reason there should be some administrative headquarters to look after these separate units. Not all of the artillery occasionally under corps control can be permanently assigned to a corps, but there is a need for a permanent administrative and tactical organization to operate and administer all artillery battalions with corps not organically assigned to divisions."

Were the problems of our non-divisional artillery different from those of other countries? No. We find that similar problems existed in the German Army. The army artillery officer was charged with the administration and guidance of the army artillery units. The Germans found, very early in the war, that the continual changing of attachment of the artillery within the army created many difficulties, "and in comparison with the divisional artillery, the army artillery units were neglected in an increasingly irresponsible manner." Artillery divisions, of combined arms, were formed in the fall of 1943. These units were to be used by the higher troop commanders as a strongpoint weapon in the attack and in the defense. Figure 1 shows the organization of the German 18th Artillery Division. These artillery divisions were dissolved in the fall of 1944, but the principles of a rigid tactical and administrative control were retained in the formation of army artillery brigades, later called *Volks Artillerie Korps.*

The Russian Army had, and used, not only artillery divisions but also separate artillery brigades. These were employed throughout the entire course of the war. There was a continuous chain of artillery command from the highest echelon to the artillery battalions. It afforded the Russians a close control, both operationally and administratively, which proved very effective in their army.

By taking this quick glance at the artillery organization of the Russians and the

Germans we can see that there are certain problems common to all non-divisional artillery units, whether in our army or in the army of another nation.

The formation of permanent groups or regiments, of mixed calibers, is entirely feasible. There is no doubt that through proper training we can have the same flexibility as we now have in our present group organization. We had this flexibility in the few ar-

and the battalion must change its SOP each time it is attached to a different group. This proved quite a problem when the battalions were shifted to a different group headquarters every week or so.

Now, if we do have permanent groups or regiments then we must provide these groups with an immediate higher headquarters. Army is still too high a level for the groups to deal with directly. Therefore, there should

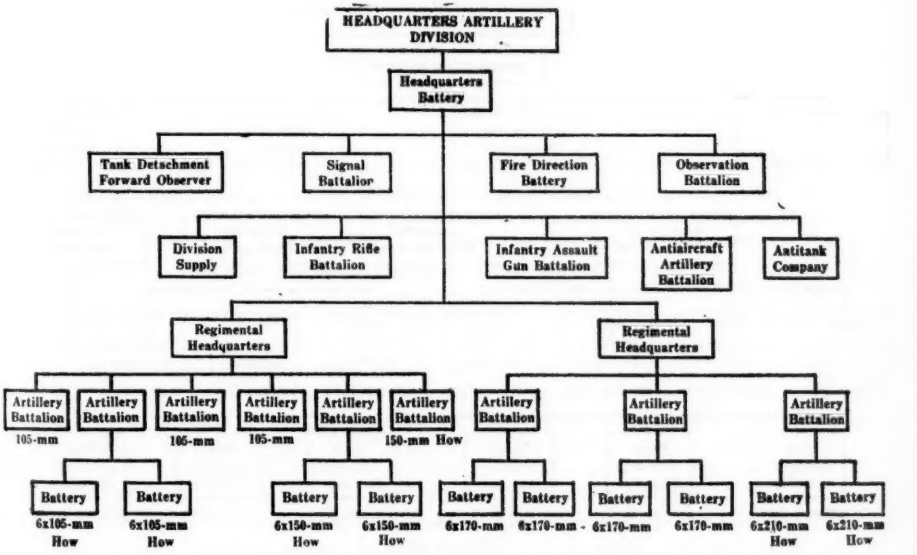


Figure 1.

tillery regiments that were committed to combat during this war. Organizing a permanent group would be the first step in solving our problem; there would be no loss of flexibility; the morale of the separate units would be improved, as there would be a higher headquarters immediately interested in the battalions and their many problems of operations, administration and supply; and there would be a standardization of the group procedure, or SOP, with which each battalion would be familiar. As it is now, each group headquarters has a different SOP

be some permanent artillery command on the corps level. The present corps artillery headquarters, supplemented by additional personnel to handle the administration and supply of the artillery, would give the artillery commander the necessary control over the artillery with the corps. This organization should have artillery units permanently assigned to it. The commanding officer of this organization should be an artillery officer of sufficient rank and experience as to be capable of advising the corps commander on the employment of the artillery,

of controlling the employment of the artillery, and of furnishing artillery intelligence on which the corps commander can base his estimate of the enemy's capabilities and thus form his own plan. The rank should be that of major general; this would be commensurate with the dual position that he would hold, as a commander and also as the artillery staff officer.

The greatest difficulty is to determine the amount of artillery that should be employed with a single corps. The strength of corps varied greatly from time to time, but for a basis upon which to work a corps composed of three divisions—two infantry and one armored—is being used. A study of the number of additional artillery battalions that were present with each division of a corps showed that as a minimum there should be 0.94 light battalions, 1.5 medium battalions and 1.4 heavy battalions. This was the *minimum* amount needed. Therefore, with our basic corps organization there should be an organization for the artillery with the corps. Figure 2 shows one organization that was recommended after a very careful study had been made.

Should additional infantry divisions be attached to the corps, then additional artillery would be required. To provide this artillery there should be a similar organization with the army which would be available to support the various corps as it was needed.

In conclusion, it is obvious that since the present organization of our non-divisional artillery has proved unsatisfactory, there is a definite need for some permanent organization for the administration of the non-divisional artillery. The separate battalions need a parent headquarters to assume the responsibility for their welfare and to maintain a close supervision over their tactical training and operations. The permanent assignment of artillery battalions to groups or regiments under which they will normally operate covers this need, even if it should prove necessary for the battalions to be detached for a short period of time. The group or regimental headquarters would be intimate with the particular problems of the

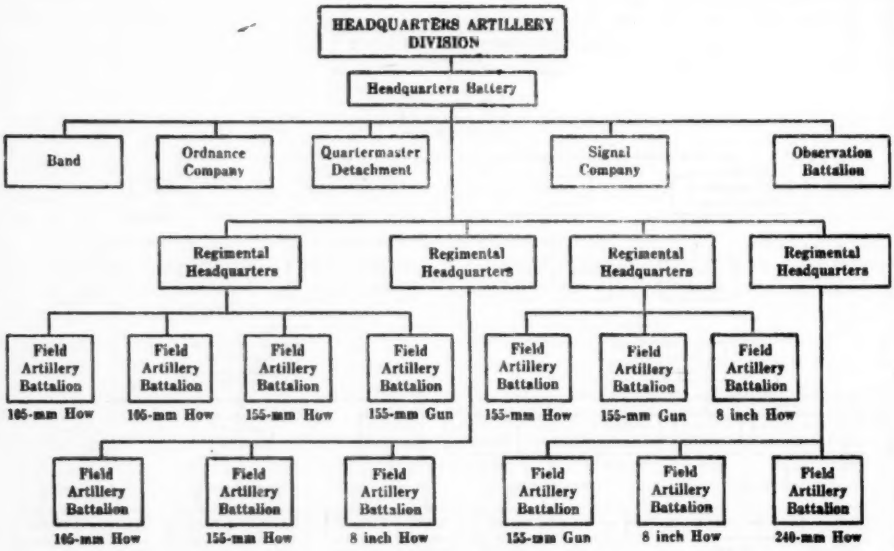


Figure 2.

various calibers under their command, and would be in a position to handle additional battalions should the occasion arise. Then if these groups are permanently assigned to a higher headquarters on about the corps level, that headquarters would be responsible for the tactical operations, administration, supply and welfare of the groups—and some of the trials and tribulations of the separate battalion would be eliminated. This higher headquarters would be assigned to army and attached to corps for tactical operation, similar to our infantry division. Whether this organization is called an artillery division or by some other designation is of little consequence. The artillery division with the army would serve as a mobile pool of artillery that could be moved to the various corps as their individual needs for more artillery became apparent. With such an organization in each of our armies we would have an unbroken chain of artillery command from the army down to and including the artillery battalion. Thus we would have a better coordination of this important supporting arm.

Not only did the Nation's industrial establishment equip our Army, but it also contributed heavily to the hitting power of the other United Nations. The allocation of military lend-lease matériel to the Allied Powers exceeded a dollar value of 20 billions. A United States armored division can be fully equipped for 34 millions. The equipment of an infantry division represents a dollar expenditure of 10 millions. Translated into these terms, the dollar value of the arms alone turned over to our Allies would equip 588 armored divisions, or 2,000 infantry divisions.

To the British Empire went enough aircraft to equip four air forces the size of our Ninth as it went into action on D-day in Western Europe. At that time the Ninth was the largest air force in the world. American raw materials made possible a large percentage of Britain's own war production. But in addition fully fabricated equipment shipped to Britain in the last two years included 76,737 jeeps, 98,207 trucks, 12,431 tanks, and 1,031 pieces of heavy artillery.

The Soviet Union received thousands of tons of American raw materials to feed its own factories as well as fully fabricated equipment. In the two years covered by this report we shipped the Soviets 28,356 jeeps, 218,888 trucks, 4,177 tanks, and 252 pieces of heavy artillery. The mobility and supply of the great Red Army was further increased by American locomotives, rails, and rolling stock. Aircraft sufficient to equip two air forces the size of the Ninth were sent to the Soviets.

Almost all of the equipment used by the revitalized French Army, which had 12 fully equipped divisions in action at the time of Germany's surrender, came from the United States. The French tactical air force which largely covered the operations of this army was also American-equipped.

General of the Army George C. Marshall

Let's Stick Together

WING COMMANDER H. PRIESTLEY, *Royal Air Force*
British Joint Staff Mission, Washington, D. C.

ON 1 April 1943, the Royal Air Force observed the silver jubilee of its establishment as a separate armed service of the Crown. In a letter of congratulation upon that occasion, General of the Army Henry H. Arnold, Commanding General of the USAAF, declared:

"On many fronts, the United States Army Air Forces look to increasing cooperation with the Royal Air Force, so that wing-tip to wing-tip we may fly destruction to our common enemies."

The pages of history already record how fully was General Arnold's prediction achieved. From a small beginning in 1942 when the joint AAF-RAF operations began, with the advent of AAF bombers and fighters, to strike Rommel's stubborn columns with regularity, and to jeopardize German supply lines by attacks on Mediterranean shipping; when a comparative trickle of AAF heavy bombers arrived in the United Kingdom and, in August of that year, began operations in daylight against key points in Nazi-occupied France and western Germany, a veritable colossus of air power was built from the combined might of our two air forces. Carrying the fight to the enemy in theaters throughout the world and softening him for destruction, RAF-AAF teamwork proved its worth in driving the Axis from Africa and in the Invasion of Sicily and Italy. It was in the attack on Germany proper, however, that that cooperation achieved its peak of intensity and effectiveness. Flying from bases in the British Isles, Allied fliers smashed Germany's industrial structure to bits, provided the air umbrella under cover of which "Festung Europa" successfully was breached, and paced the Allied armies to the final kill.

The story of the AAF and RAF in World War II is one of cooperative effort, not only flying wing-tip to wing-tip, but in a pooling of resources and technical skill, and of the merging of production. That merging is perhaps best exemplified by the Mustang, one of the outstanding fighters of the war. Built in America to British specifications and powered by an American-designed and built engine, it showed, in the hands of RAF pilots, tremendous potentialities and accomplishments as a long-range, medium-low altitude fighter. Britain already possessed, and was producing in quantity, an engine which had shown outstanding performance at high altitudes, the Rolls Royce Merlin. Rolls Royce production techniques and designs were transferred to the United States and Merlin engines built under license by an American firm were fitted to the Mustang. The result was that the AAF was provided with an outstanding escort fighter, an aircraft more than a match for the best of the Luftwaffe and, at the same time, capable of providing round-trip protection for bombers on the deepest daylight penetrations of Hitler's Reich.

The application of jet-propulsion to combat aviation was one of the outstanding developments of World War II. In this field, again we find a full and wholehearted cooperation between American and British designers and technicians. Air Commodore Frank Whittle began his jet-propulsion researches in the United Kingdom during the late 1920's. By 1941, Whittle units were flying in Great Britain. In July of that year, the British Ministry of Aircraft Production made British developments available to the United States—six months before Pearl Harbor. American investigators arrived in the United Kingdom in August, and one month later detailed design drawings were handed over to American representatives in Britain for transmission to the United States Air Forces. On 4 October, a sample Whittle unit, together with detailed drawings and specifications, arrived at the General Electric plant, accompanied by four British jet technicians. On the basis of the engine and design drawings, General Electric began experimental

production of a jet unit, and, simultaneously, Bell Aircraft started the design of an appropriate aircraft, the XP-59. The trial flight of the XP-59 with General Electric power units was made in September 1942. From that date, General Electric has continued development of larger and more powerful units, on the basis of slightly modified Whittle designs, culminating in the I-40, power unit of the Lockheed P-80.

The story of the AAF and the RAF in the European War is one of free and full cooperation, a pooling of all material and technical resources, a story of American air power based on a solid foundation of RAF knowledge and experience. And in no aspect of the war is that story better exemplified than in the field of air intelligence.

When the AAF began to move into the United Kingdom for operations over Hitler's Europe, RAF intelligence already was in possession of a considerable storehouse of information on targets in enemy territory, the strength, capabilities, tactics and order of battle of the German Air Force. That information had been gathered, however, only by dint of unceasing labor, and under the handicap of development of an intelligence organization from a puny infant of less than one hundred people to a body capable of grappling with the unceasing demands for information necessary for the planning and execution of successful air operations.

As late as 1938 the total strength of the RAF intelligence organization was eighty persons, including air attaches and Air Ministry Staff officers. Expansion of that organization first was undertaken early in 1939, when civilian personnel were enlisted in the reserve for intelligence duties in the event of war. Training of such personnel, however, was far from adequate, chiefly because no one knew just what would be the duties of air intelligence officers in time of war. It was with a bare nucleus of relatively untrained civilian officers that the RAF entered hostilities.

Expansion was slow; recruiting proceeded during the winter of 1939-40, but it was not until Britain embarked on the heroic tragedy of Dunkirk and the grim fight for life in the Battle of Britain that the ranks of the RAF intelligence organization began to fill out. Naturally, during those times of stress, little could be done to train newly recruited intelligence officers. There was no school at which they could learn the fundamentals of their new duties; the need for their presence with operational units was urgent. Thus officers had perforce to be assigned to duty in the height of battle with little or no training. Although manuals of instruction on what to do under certain set circumstances were prepared and distributed, it was not until September 1941 that an intelligence school to teach the basics of air intelligence was activated.

Despite this almost uncontrolled growth, the air intelligence organization accomplished its primary mission. By the spring of 1942, when the first wave of AAF personnel reached the United Kingdom, RAF intelligence was in a position to assist in the education of its "freshman" brothers. The treasure house of knowledge immediately was opened to the AAF, and all that lay therein made available. RAF intelligence procedures were explained and offered for acceptance, modification, or rejection; the German economic and military position, with all its targets for air attack was presented; and the AAF was made a full partner in the proceeds of the various channels already established for the collection of that information vital to air intelligence.

From the very beginning a comradeship, a truly free and joint enterprise was established. RAF intelligence liaison officers were assigned to all operational AAF units, to be available for advice and counsel, and to provide an easy channel for utilization of intelligence gathered by the RAF organization. Joint units were established, such as that for the interpretation of aerial photographs, where British and American interpreters worked alongside each other as fellow members of the unit. RAF intelligence officers were dispatched to the United States

to assist in the training of the many thousands of American intelligence personnel who would be required to staff the gigantic air striking force under creation; and to insure that all necessary RAF air intelligence was made available to the AAF in the most direct and speedy manner.

The training of U.S. combat air intelligence officers in the United States had, of necessity, to be basic and general in nature. Such officers, on completion of training, were likely to be assigned for duty with a unit already operating, or destined for operations, in either the European, Mediterranean, Southwest Asia or Pacific theaters. Theater orientation and indoctrination consequently was limited. Thus A-2's arriving with operational units in the United Kingdom had only a general schooling in operations in the European theater and of the RAF intelligence organization alongside which they would be operating. The product of the latter would be one of their main working tools. On the other hand, the RAF had, since September 1941, been operating an intelligence school for the training of its junior officers. The course of instruction provided a basic training in RAF intelligence organization and procedures. Thus, AAF intelligence officers on arrival in the United Kingdom attended the RAF intelligence school, thereby obtaining indoctrination and orientation essential to their future duties. Many AAF officers also took courses of instruction at RAF specialist schools, such as the school of Aircraft Recognition.

Not all that had become standard practice in the RAF was suitable for AAF operations in Europe, chiefly because of the fundamental differences between day and night air operations. Target maps developed by the RAF for its night bomber crews were unsuitable for daylight operations; the essential data was taken by AAF personnel and modified for presentation in a form proved by practical experimentation to be most suitable for daylight bomber operations. Essential differences between the RAF's individual night bomber work and the AAF's daylight operations in formation, together with the air opposition encountered during such operations, necessitated changes in RAF briefing and interrogation procedures to fit them to AAF needs. Basically, it may be said that the RAF provided the foundation; the building erected thereon, while of American brick, still utilized a lot of British mortar to hold the bricks together.

With the growth of the AAF, both in stature and experience, it became a full and equal partner with the RAF, its air intelligence organization not only able to stand on its own feet, but able to take its full share of responsibility in collecting necessary information, and in processing that information into resultant intelligence. But never was there a divergence of the paths followed by AAF and RAF intelligence organizations; in fact, the reverse was true, their paths became more and more convergent until finally they were superimposed and became one single path—two organizations with the same common purpose, so closely integrated that they were one unit.

The RAF intelligence organization handling sources of information such as interrogation of prisoners of war, exploitation of captured documents, and inspection of captured enemy air matériel were presented with information concerning the European war which was not available to the AAF in Washington. Through the assignment of liaison officers to appropriate branches both in the Air Ministry and in Headquarters, AAF, a free and complete transmission to Washington of all necessary information and intelligence was initiated and continued throughout the European War. By the same doctrine, RAF intelligence was less exposed to the Pacific War than was AAF intelligence and the established liaison channels provided for a frequent and full transmission of information on the Pacific War from AAF to RAF.

This interchange of information was merely the implementation of a broad agreement made at the highest level. British intelligence agencies, by the time of the attack on Pearl Harbor, had acquired a vast amount of experience and knowledge in the gather-

ing of intelligence concerning the European enemy; in addition, London, through its proximity to the continent of Europe, was an excellent center for the concentration of the intelligence effort with regard to the European War. On the other hand, U.S. armed forces were taking by far the larger share of the war against Japan. Communication facilities are essential to modern war and to that precept intelligence is no exception. Washington was the most suitable center from which to direct the Far Eastern War. It was agreed, therefore, that the Anglo-American effort in the European Theater should be centered in London, while the effort against Japan should be centered in Washington. Thus, the intelligence center for the European War was established in London, while Washington became the focal point for the broad strategic directions for the war against Japan. American and British intelligence personnel were exchanged between London and Washington to provide in each center those personnel best qualified and most experienced in the work being carried on.

It presumably will be a matter of argument for some time as to what was the most vital factor in deciding the outcome of World War II. It is probable that historians will not agree on this point. Some will advocate that air power was decisive, others that quality and quantity of ground armament was decisive; the atomic bomb, sea power, morale and generalship, all will have their protagonists. If one may be so bold as to express an opinion on the subject, the writer believes that teamwork was the key to victory. American and British fighting troops operated side by side in each service, and together produced a force overwhelming in its majesty. But all the arms, the aircraft, the naval vessels, the incredible weapons of war which our two nations produced, would have gone for naught without guidance and direction. Anglo-American team work was no better exemplified than in the planning of overall strategy, and the success and the wisdom of such planning owes a great deal, if not everything, to the sound foundation laid by the joint intelligence effort.

World War II demonstrated the untold benefits which accrue from a joined and united team, a team in which no time was wasted in specious argument as to which member, American or British, was contributing more. General of the Army Eisenhower and his staffs which directed the North African and European campaigns demonstrated in the clearest possible fashion that American and British personnel can be welded together in one, unconquerable unit, a certain insurance of victory.

Now that World War II has become a record in the pages of world history, and in the inevitable post-hostilities reaction to the horrors of war, each nation turns to withdraw behind its natural boundaries to say, "Never again." That is the hope and prayer of all thinking mankind. But that very withdrawal behind national boundaries is one of the surest ways of making it "soon again."

Let us remember the invincible team of the English speaking nations. Let us say that in the balance of teamwork against national pride and national prejudice, if the scales are honest, there can be no doubt of the stark clarity that the greatest insurance for future world peace lies in a joint effort between the United States and the British Empire.

During World War II we kept no secrets from each other. All was shared because successful prosecution of the war demanded it. Let us realize that successful prosecution of world peace makes a similar demand. We are co-partners in the dreadful responsibility of atomic power. Let us maintain our united effort in the future for the benefit not only of our two peoples, but the peoples of the world. Let us continue to be co-partners for world peace. Let's stick together.

Battle of Bitche

Prepared for the *Military Review* by the Staff of the 100th Infantry Division

Brigadier General John B. Murphy, in the letter accompanying this article, stated, "General Burress and I have discussed this operation at length, both before and after its execution and have decided that it was the nearest thing that we have had to a 'book solution' during our entire active participation. The entire operation was brilliant. The timing to various objectives was perfect, and it went through according to schedule, without a hitch. There were several reasons for this. We had time for planning; we had information of the enemy; we knew the ground; we knew what we needed in the way of implements;—and last, but not least, we were given a free hand by Corps. The only variation from the original plan was that, instead of a power drive on a narrow front, with the center regiment making the main effort, it turned out to be a beautiful envelopment, which started as a close-in and ended as a wide envelopment."—THE EDITOR.

Background for the Bitche Operation

THE 100th Infantry Division first attacked the Bitche area on 17 December 1944. This attack was discontinued on 21 December 1944, due to a change in mission. During these few days of offensive operation, the entire area west of Bitche, including Fort Freudenberg, Fort Schiesseck, and Freudenberg Farm, had been neutralized and cleared. Upon being assigned a defensive mission, our lines were straightened out and our sector widened, causing us to withdraw from the Schiesseck area to better defensive terrain, and also to shorten our front line.

During this initial operation, it was found that the forts around the Bitche area were impervious to the heaviest artillery we had available, firing by indirect laying, and that the most effective weapon was the M-12 (155-mm gun, self-propelled) using direct laying from ranges varying between 800 and 2,000 yards. We also learned that engineer demolitions containing the heaviest charges were ineffective. 240-mm shells, with concrete-bursting fuses, merely ricocheted off the forts.

It was well known at this time that the high ground to the west and northwest of Bitche was the key terrain in that area. It was also known that in order to occupy Bitche itself, it would be necessary to reduce Fort Grand Otterbiel and Fort Ramstein, as all of the fires of these forts were mutually supporting and made the exposed high ground around Fort Schiesseck too hot to hold.

During the short period we had occupied the high ground around Fort Schiesseck, much detail was learned of the avenues of approach and other terrain features.

During the winter months, when the Division was on the defensive on a very wide front, much study was given to the Bitche operations, which it was felt would be renewed when the Seventh Army again went on the offensive.

Events Immediately Prior to the 15 March Attack

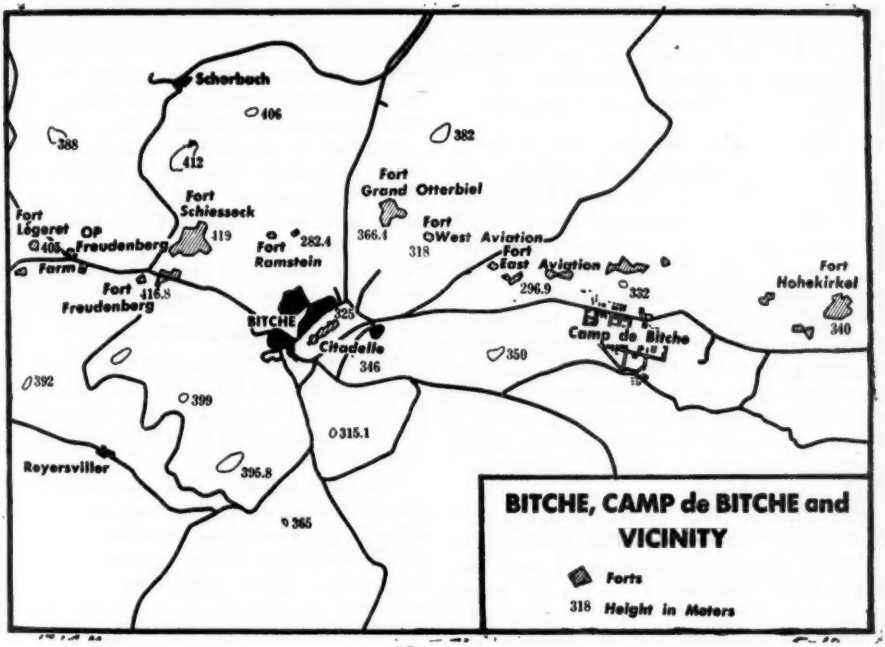
Prior to the 15 March offensive we had about a week or ten days for planning. The following known factors assisted materially in formulating our final plan:

The Corps plan was such that both our flanks would be open after a very limited advance, due to the fact that the division on our right, which faced east, was to remain static. The division on our left; making the main effort of the Corps with the mission of breaching the Siegfried Line to their front, were attacking due north. Our direction of attack would be east and northeast.

The tools necessary to reduce the strong Maginot forts, in case they should be held in force, were procured. These consisted chiefly of heavy artillery and self-propelled M-12s.

The Germans had added a great deal to these fortifications in the way of field works, road blocks and minefields. The locations of a great many of these were known to us through active patrolling and information received from prisoners of war.

The high ground to the north and west of Schorbach contained many mortar and *nebelwerfer* positions and was a very necessary



Map 1.

greatly reduced, as shown on the accompanying maps. As stated before, the division on our right (south) flank was to remain static.

The division on our left (west) flank was to attack due north and breach the Siegfried Line. The mission of the 100th Infantry Division was to seize and hold Bitche and Camp de Bitche, reduce the forts surrounding this area, and protect the right flank of the piece of ground for us to seize in order to hold the Schiesseck hill.

Information from Photo-Interpretation units and the XV Corps Artillery showed that a large amount of German medium artillery had been withdrawn to the outer defenses of the Siegfried Line, which was only 16,000 meters to the north and east of Bitche.

The XV Corps Plan for the Attack 15 March 1945

The 100th Infantry Division had its sector Corps up to the outer defenses of the Siegfried Line, where we were to hold until the divisions on our left had made the breakthrough. At this time we were to follow the 6th Armored Division through the gap and advance rapidly to the Rhine River, via Zweibrucken, Neustadt and Ludwigshafen.

The divisions making the main effort had been recently put in the line from rest areas. The 100th Infantry Division had been living in their foxholes on a broad front since assuming the defensive on 21 December 1944. The bulk of the Division had been employed

in the defensive in order not to leave gaps in the line for German infiltration into our rear areas, and we were in doubt as to whether our infantry could march any distance after being immobile all winter.

The divisions making the main effort were to jump off at 0100, 15 March. An intense counterbattery program was fired by the Corps Artillery at 0100, but was fired chiefly at known battery locations in front of the main effort, or at batteries that could intervene in the main attack. The time of attack of the 100th Infantry Division was left to the discretion of the Division Commander.

The 100th Infantry Division Plan of Attack

The Division Commander's decision was to attack at 0500, 15 March, and seize the high ground to the west and northwest of Bitche from present front-line positions, with regiments abreast—399th Infantry on the right (south) flank, 398th Infantry in the center, and 397th Infantry on the left (west) flank. One company each of tanks, tank destroyers and 4.2-inch chemical mortars was attached to each regiment. The 399th Infantry Regiment was to protect the right (south) flank and the 397th Infantry Regiment was to protect the left (northwest) flank of the Division.

The Division Artillery was assigned normal support, except that the 250th Field Artillery Battalion was grouped with the 374th Field Artillery Battalion in direct support of the 398th Infantry Regiment. Priority of fires was given to the 398th Infantry. The 781st Tank Battalion (less three medium tank companies) and the 100th Reconnaissance Troop were in Division Reserve.

Factors that Assisted the Division Commander in Making His Decision

The Commanding General of the 100th Infantry Division selected the hour of 0500, 15 March, for the jump-off because he knew the location of minefields and of enemy defensive works in his immediate front for a limited distance only. He did not want to advance too far in the dark, run into uncharted minefields and defensive works and have the attack bog down before daylight.

In order to secure surprise, the artillery of the Division fired only normal night fires, mainly road-runners, prior to "H" hour. An elaborate plan of pre-arranged fires was carried by each forward observer so that he could call immediately for concentrations on any defenses that should hamper the progress of the infantry.

The Air OP's were sent aloft at 0500 to locate gun flashes of either enemy battery positions or forts that opened up on our troops. An antiaircraft searchlight was used as an orienting point for these planes during the remaining hour of darkness.

The bulk of the means was assigned to the center regiment—the 398th Infantry—because this regiment had the most difficult task. It was also assigned the main effort because each of the flank regiments had an additional mission of protecting the flank of the Division upon which each was operating.

The Attack

All regiments jumped off as scheduled. The artillery air OP's did not locate any flashes from either batteries or the guns in the forts until some time after the attack was launched.

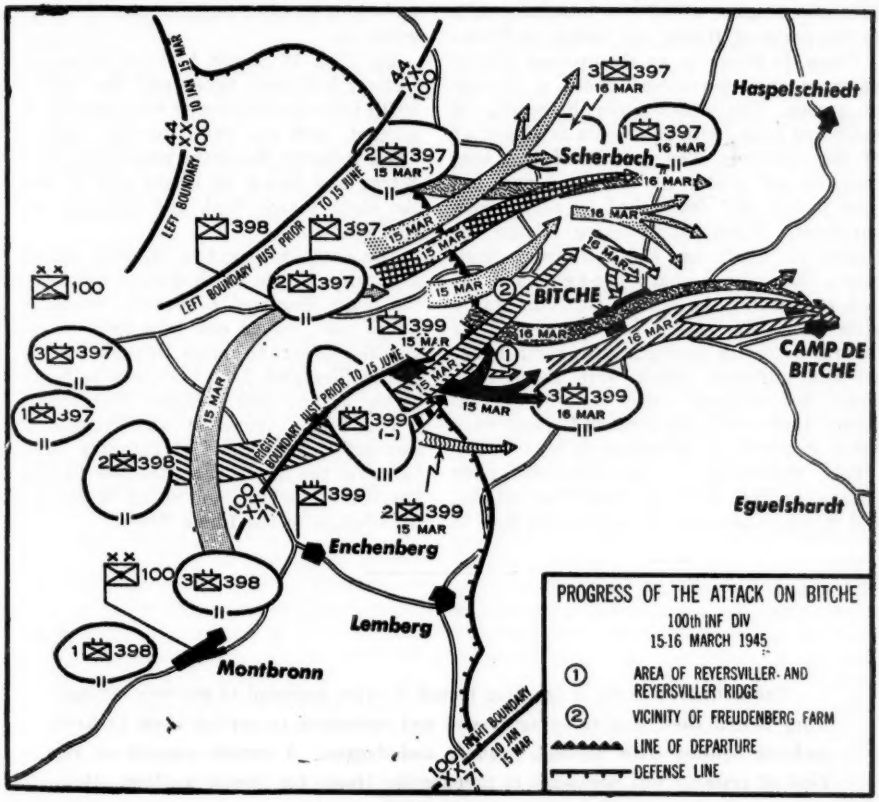
The 399th Infantry Regiment, with its attached tanks, quickly cleared the Reyersviller Ridge. This action sealed off a considerable body of the enemy that was south of Reyersviller Ridge, but they successfully withdrew through the woods to the east in the direction of Camp de Bitche. The regiment was on its objective early in the attack, and awaited orders for the coordinated attack on Bitche and the Citadel located therein.

The 398th Infantry Regiment, in the center, had much tougher going and was held up by enemy fire and mines in the vicinity of Freudenberg Farm. One battalion bypassed this resistance to the east and after a slow start, the regiment advanced rapidly to its objective and seized the main division objective by early afternoon.

The 397th Infantry Regiment promptly broke through and cleared the high ground north and west of Schorbach, then cleared

and occupied the village itself, and overran the enemy's mortar and rocket firing positions which were known before the attack, thereby taking a great deal of pressure from the center regiment. This regiment made a penetration of 6,000 or 7,000 meters in the direction north and east, and got to its final objective by mid-afternoon. We believe that the rapid envelopment by the

By the end of the day, all regiments were on their initial objectives and the artillery was displaced and registered in preparation for the next day's operation, namely, the reduction of Bitche and Camp de Bitche. The advance was resumed at 0600, 16 March. The 399th Infantry entered Bitche from the west and south, from the direction of Reyersviller and Reyersviller Ridge, quickly



Map 2.

397th Infantry caused the entire fortified area to fall like a ripe fruit because its action eliminated all of the fires of supporting weapons. During this rapid advance, this regiment captured the remnants of a regiment of *nebelwerfers* and many enemy mortars.

cleared its part of the town, and continued its advance to the east in the direction of Camp de Bitche.

The 398th Infantry, advancing from the high ground in the vicinity of Fort Schiesseck, entered Bitche from the northwest, quickly cleared its portion of the town and

the few remaining snipers in the vicinity of the Citadel, reduced Fort Ramstein and Fort Grand Otterbiel, which surrendered after a couple of direct hits from an M-12, and proceeded to the east toward Camp de Bitche.

The 397th Infantry continued its spectacular advance and, advancing in column of battalions to enable it to furnish better flank protection, seized all of the prominent hills to the north of Bitche and Camp de Bitche.

Camp de Bitche is an old pre-war French garrison that garrisoned about a division of troops. The construction is mostly of stone and brick, with basements in almost all of the buildings. The post itself had been occupied all winter by Germans and had been pretty well demolished by aerial bombardment. Upon approaching Camp de Bitche, the 398th and 399th Infantry Regiments had quite a sharp fire-fight, and the task of cleaning the post of Germans was a little slow. The enemy had augmented its natural defensive strength with earth bunkers and pillboxes, which were reduced by direct fire weapons from tanks. Several enemy tanks and self-propelled guns were either captured or destroyed in this action.

Fort Hohekirkel is approximately 1,500 meters to the east of Camp de Bitche, and it was necessary to reduce this fort in order to hold Camp de Bitche unmolested.

The Air OP's had located quite a concentration of enemy tanks in the vicinity of Eguelshardt. This was in the sector of the Corps on our right, but it constituted quite a threat to our operation around Camp de Bitche. We put some air missions on this concentration and watched them very closely, but they appeared to be inactive, either due to lack of gasoline or ignorance of what was going on.

By 1700, 16 March 1945, all assigned objectives had been taken and the 399th and 397th Infantry Regiments were moving north abreast, with the 399th on the right. The 398th Infantry Regiment was left to garrison Bitche and Camp de Bitche and to protect the right (east) flank and the rear of the Division.

The next day, the two infantry regiments advancing to the north gained contact with the main Siegfried Line and, according to Corps plan, halted and held their positions, awaiting orders to follow through the breach in the Siegfried Line that was to be made by the 3d and 45th Infantry Divisions.

The Bitche operation was brought to a successful close; the 71st Infantry Division took over the Bitche area; the 100th Infantry Division assembled, and on 22 March began its advance to the Rhine River.

The British methods of teaching trench warfare appealed to me very strongly. They taught their men to be aggressive and undertook to perfect them in hand-to-hand fighting with bayonet, grenade and dagger. A certain amount of this kind of training was necessary to prepare the troops for trench warfare. Moreover it served to stimulate their morale by giving them confidence in their own personal prowess.

General of the Armies John J. Pershing

Operation Blacklist

COLONEL ANDREW T. McANSH, *General Staff Corps*

THIS article has been written from the viewpoint of a Division Chief of Staff engaged in the planning for an assault amphibious landing, and embraces those conferences, decisions, and details involved in planning such an operation, from the time the corps directive is received until the completed field orders are issued and loading completed.

With the surrender of Japan, all preparations for the original assault on the Japanese mainland, known as the OLYMPIC operation, were cancelled and a new operation known as BLACKLIST was substituted. The 33d Division, as part of I Corps, was one of the divisions slated to participate. Early in August a telephone call from I Corps to the Division Commander requested his presence at the Corps CP at 0900 the following morning.

As our story opens, the Division Commanders, with key members of their staffs, are assembled at the Corps CP. In order, G-2, 3, and 4 outline pertinent parts of the Corps Field Order for the coming operation. Copies of the tentative field orders are then distributed.

Immediately following this meeting the Commanding General, 33d Division, assembles his staff officers and says, in effect:

"I want a meeting of this group at our CP at 0900 tomorrow. G-2, be prepared to give your recommendations on the landing beaches. G-3, be prepared to present your plans on tactical groupings, and G-4, let me have what supply recommendations you have. At that time I will put out the division decision and plan. Chief of Staff, secure permission from Corps to have a Liaison Officer report from each attached unit to division headquarters tomorrow, also get the Commanding Officer of our 544th Boat and Shore Regiment present for our conference."

Office of the Division Commander.—Present: General Staff, Assistant Division Commander, Division Artillery Commander, Commanding Officer Boat and Shore Regiment. Commanding General hears the recommendations of the General Staff and then announces his plan. He then directs the Chief of Staff to call a Commanders' Conference of subordinate and attached units for 1600 to acquaint them with the essential details, also to have a War Plans Room set up so the augmented division staff officers can work.

Conference Room.—Commanding General informs the commanders of the details of the operation as known at this time. He further informs them that unit staff officers will constantly be working with members of the division staff, and planning will begin at once. He has G-4 disseminate supply levels and other pertinent supply data. G-4, called upon, further elaborates that all units, divisional and attached, will prepare their unit personnel and tonnage tables, cargo list, and heavy vehicles list, and turn them into the Division TQM (Transport Quartermaster) office by 1800 two days later.

Let us now look at the activity going on around division headquarters. On the first warning order given some time ago by corps, the Chief of Staff had directed the Headquarters Commandant to prepare accommodations for a large number of visitors and liaison officers and commanders of attached units, also he has directed that additional office space be made available for the staff of the Boat and Shore Regiment who will make up the Division's shore party; office space for naval representatives and for TQMs of all units who will work with G-4. G-1 is getting his replacement list in to corps, etc; G-2 is working on his intelligence annex. G-3 surveys his situation, as he is charged with organization of the units for combat and for allocation of priorities. Concurrent with planning must be training of the division and attached units. An amphibious training program is starting shortly and a Training Memo must be issued covering this and other training. He decides to assign his assistant, with one additional officer, to plan and supervise current training. The Division Commander has already charged

the Assistant Division Commander with outside supervision of amphibious training, and G-3 has his assistant work closely with him. In the planning phase for the operation, G-3 selects two officers, a captain who, under his direction, will do the pick and shovel work, and a lieutenant experienced in TQM work who will work closely with the TQM and maintain liaison with G-4, as G-3 and G-4 must work closely together on all this planning.

While G-3 is waiting on the TQM to give him the total tonnage and space needed to "lift" the division, he starts organizing the division for combat, using the troop list furnished him by corps and keeping in mind the Commanding General's directive on tactics ashore. To each combat team (now SOP in the division) is allotted the units that will be needed to accomplish the initial objective;—medium tanks, antiaircraft, automatic weapons units, chemical mortars, tank destroyers, amphibious tractors and tanks, combat engineers, shore party, beach demolition party, Jasco (Joint Assault Signal Company). With G-4 he decided how much additional labor the shore party will need and receives the recommendations from the Commanding Officer of the Boat and Shore Regiment regarding attaching shore party to assault RCTs. Troops not attached to RCTs are listed as division troops.

Over in the G-4 office, G-4 is busy with his supply heads and the Shore Party Commanding Officer. Corps has told him what the division will take in. He computes the tonnage and space needed to lift all division supplies not carried by the combat RCTs and gives these figures to the TQM. His next problem is to secure from Base his thirty-day level of supplies and start hauling it to the dumps. With the Shore Party, Division Engineer, and Navy, he reconnoiters the beaches for slotting dumps for ships and LSTs.

Office of the Chief of Staff.—Present: G-3, G-4, and TQM. Previous to this meeting, from the figures submitted to the division TQM by units, and by G-4 for Division bulk, the TQM has determined the square footage, cubage, and DWT (dead weight tonnage) necessary to lift the Division. From a study of the ships characteristics, he has determined what the shipping allotted to the division will carry. It is found that while the DWT and cubage are satisfactory, the allotted square footage will lift only about sixty per cent of the vehicles listed. Hence the conference.

This conference is one of the most important held. No arbitrary decision can be made. It is a series of compromises after consultation with the interested commanders. For example: an antiaircraft battalion may have to be cut drastically in vehicles in order to permit a tank battalion to go in at practically full strength. A shore party must have its dozers and cranes even at the expense of some other unit's equipment. And so it goes, until the final figure is computed which permits lifting by the shipping available.

Upon completion of this conference, G-3 can now proceed to allocate shipping to subordinate units. Naval shipping is usually set up with a Transport Division lifting a RCT with four APAs (Troop ship) and one AKA (cargo ship). In addition, usually an AKA and two APAs are left over for division shipping. Also included will be LSDs, LSTs, and LSMs.

Along with the allocation of shipping, work on the Landing Plan must go along hand in hand. Questions will arise. Shall assault troops be put ashore in LVTs or boats? If LVTs, will assault troops ride the LSTs or APAs? Will tanks be put in LSDs or LSMs? Artillery in APAs or LSMs, or DUKWs in LSTs? Usually a combination of all are used. A naval representative should be present now to answer questions on loading of the ships and to discuss the timing between waves of the landing plan.

In allotting shipping the ideal arrangement would be to give the RCT commander just enough shipping to lift his RCT with its personnel and material. Unfortunately, ships' characteristics are not readily adaptable to that arrangement. An APA has personnel space left over after loading a BLT (Battalion Landing Team), and a regimental

AKA has empty space after regimental supply is loaded. So G-4 must allot division bulk to be placed on a RCT AKA, and G-3 allots troops to battalion APAs to be carried in. Inasmuch as only one TQM should load one ship, the RCT TQM is charged with the responsibility of loading everything that goes on his ship.

G-3 Office.—Present are unit TQMs, G-4 representatives, subordinate S-3s and TQM. G-3 distributes the allocation of shipping to each RCT, to Division troops and the Tactical Groupings. Present also are representatives of attached units. Subordinate units can now begin their planning. Shipping allocations and priorities completed, the problem of loading now centers around the G-4, S-4, and the TQMs. Space is alloted at Division Headquarters for these subordinate S-4s and TQMs, as it is highly desirable for all concerned to work closely together.

The complete Field Order has now been received from Corps, and G-3 can begin preparing his annexes:—artillery, intelligence, shore party, engineers, and chemical. In the meantime, with the Navy and the subordinate S-3s working together, the first landing plan is prepared.

Back in the G-4 office, the administrative plan with its annexes is taking form. G-4, working with the Engineer, is assigning dumps, and the near shore plan is being developed with supplies to be stacked on beaches. With the Shore Party Engineer, plans are completed for the assistance he will need. One thousand men are needed for shore labor for D-Day. This can be met by tagging a reserve combat battalion or by having each RCT form a provisional company to be turned over to the Shore Party Engineer. Number of trucks from tactical units needed for beach duty are decided upon and allocated. Distinctive markings are prescribed for shore party vehicles, shore labor party, and artillery ammo lots. The problem of waterproofing vehicles is given consideration, for much depends upon it. The Division Surgeon, Navy representative, and Shore Party Commanding Officer confer with G-4 on evacuation of casualties across the beach. G-4, Shore Party Commander, and Provost Marshal discuss traffic control. A complete shore party map must be issued so the artillery, antiaircraft, and other units will know where they can locate their installations.

In the TQM office, detailed plans for the loading of each ship are taking form. Marine Corps TQMs from the Transport Division have arrived and are available for answering questions regarding their ships.

Regimental field orders are shaping up. From conferences with the S-3s, G-3 now has a breakdown of troops of each BLT and their landing schedules. Where desirable, portions of these are incorporated into his field order for the benefit of higher headquarters.

The Commanding General's Office.—Drafts of completed field order and administrative order are in the hands of the Chief of Staff. With these worked over, section heads stand by to defend their drafts with the Commanding General. Upon his approval, stencils are cut and the field order published and distributed.

G-4 office on the beach.—Time has slipped by and the transports are now lying off shore. Equipment on the beach is flowing smoothly to the ship and mobile loaded trucks are arriving from unit areas. On board ship the TQMs are busily engaged in stowing cargo brought aboard as they desire it; plans for troop billeting are going on. As the last hatches are filled, the troops start going aboard, with the equipment that is going to accompany them into the troop compartments.

On shore, the weary staff turns over the final plans to the Commanding Officer of the rear echelon, who is coming in some twenty days later.

The Commanding General arrives and the last troops board their ship, and another beachhead operation is on.

A Quantitative Method for Measuring the Gain in Knowledge of Students

LIEUTENANT COLONEL A. J. P. WILSON, *Chemical Warfare Service*
Instructor, Chemical Warfare School

ONE of the fields in which the military technique has been an out-standing success is in pedagogy. The largest mass education ever attempted had to be undertaken to train men from civilian occupations in the thousands of specialized classifications necessary to cover the many requirements of an armed force.

Speed was an additional requirement, and it was necessary that all courses in military schools be shortened and concentrated to the "Nth" degree. Every possible means were developed to give the vital knowledge in the minimum time. If the teaching is on an honest basis the aim is to give the students a thorough understanding of the subject and not just to pass the examination. Therefore, it becomes highly important to have a means of measuring how much the student actually assimilated.

Development

The author has been in charge of instructions in supply and logistics in the Officer's Division of the Chemical Warfare School. As is customary, at the end of the series of lectures and exercises on this subject, an examination was given consisting of about twelve questions and covering a period of an hour. Analysis of the papers of several classes indicated that some vitally fundamental points were being missed by large numbers of students, and some points were being answered correctly by practically everyone. The question then arose as to whether insufficient emphasis was being put on those points being missed and too much on the others. It was also necessary to ascertain how many of these latter points were known to the student before the instruction started.

It was decided to select twenty or thirty of the most important principles and points, the knowledge of which was believed essential if one were to be considered proficient in supply. These points were then built into a rather short and condensed written test. Most of the questions were of the multiple choice variety i.e., in which the student has only to check the correct answers or the correct principles among the several given.

By this method the students were able to complete the test in a very short period of time, because, in a vast majority of the cases, they had only to check the correct answer or answers. Thus it was possible to obtain a quantitative measure of what the class knew on these main principles and the points on which they were weak. This was the purpose of the test.

The Test

The test was designed to:

1. Give a good coverage of the field of supply (thirty important points were covered).

2. Be difficult, so as to give as accurate a gauge as possible of how much the student knew.

3. Reduce to a minimum the chances of guess work.

4. Be short (fifteen minutes was the allotted time), so as not to prejudice the student against the course.

It was designated as "Supply and Field Service Information Test," and was given to the students one or two days after the start of each class. The students were told at that time that it was given for the purpose of finding out how much knowledge of the subject of supply they possessed, that it was not a "pay" examination and would not count against their record; and that they were not to guess at the answers if they did not know.

When instruction on supply was begun, which generally occurred in the second or third week, the approved solutions to the test were posted on the bulletin board for three days. During the course of instruction each point was given from the platform in

addition to being covered by assignments in manuals, circulars, and school mimeographs.

At the end of the supply course, the identical test was given again to the class. The students were told then, that it was a "pay" examination and that they were to try to answer all questions. The results of this FINAL test were compared with the scores made on the INITIAL test.

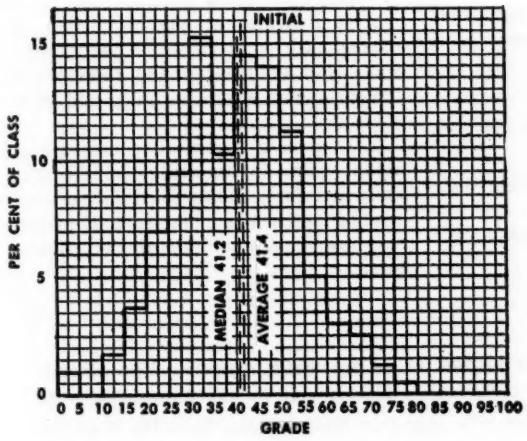
By the use of this test, it is possible to determine the following:

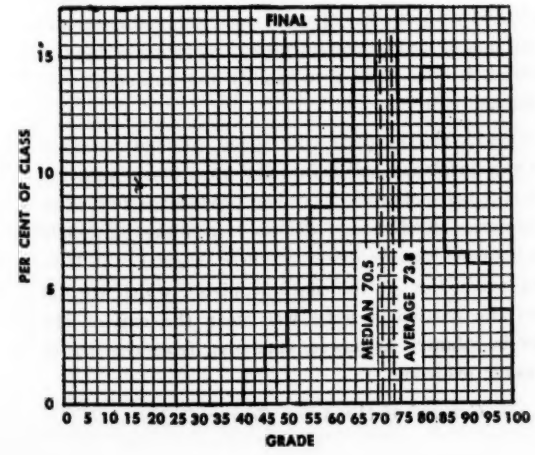
1. The gain in knowledge made by the class and by individual students.

2. A comparison of this gain between other classes and the average of all classes as well as a comparison of individual students.

3. An analysis of the points on which the class was low.

4. The relative teaching abilities of instructors.





Actual Results

This test was given to over one thousand students in various classes covering a period of over a year, and the results are tabulated as follows:

	Initial	Final
Average (Arithmetic)	41.4%	73.8%
Median (Midway between highest and lowest)	41.2	70.5
Mode (The block that occurs oftenest)	31-35	71-75

No significance should be attached to the values as they can be arbitrarily varied by changing the questions. Only the increase or gain should be considered.

The accompanying frequency chart shows the comparative portion or per cent of students at different grades for the initial or pre-course test and for the final or post-course test. As is indicated by the charts, the students made a gain of approximately 30 points on the percentage scale.

Classes varied of course, and students in some cases made gains as high as eighty points. Some students (very small number) showed a loss—as much as fifteen points.

Separate score was kept of officers who had previous experience on the subject either actual (field) or theoretical (other supply courses). The results showed an initial score of

64, much higher than inexperienced men, but their gain was only 12.4 which gave them a final score of 76.4 only slightly above the average of all final scores.

One of the most interesting cases occurred when twelve Chinese Army officers were assigned to one of the courses as observers. They took this test and their average initially was 8.2% and on the final test was 44.3% or a gain of 32.1% which was very close to the gain in points registered by American officers. However, it represents a much greater gain on a percentage basis because of the lower base.

Conclusions

Any ordinary examination that is well constructed will indicate:

1. The rating of the students within their class.

2. The rating of the class against the overall average.

3. That the students have or have not sufficient knowledge, to be passed.

This test has these qualifications and, in addition, has the following advantages over that of the ordinary examination in that:

1. It indicates at the beginning of the course the relative amount of knowledge on the subject possessed by each student and by the class, therefore, it shows the instructor what points need special emphasis during the course of instruction and the relative amount of instruction called for.

2. It indicates at the completion of the course, each point on which their knowledge was lowest and greatest and, therefore, shows the instructor where he failed and where he succeeded.

3. It gives a quantitative measure of the actual gains in knowledge of the students and, therefore, shows the relative effectiveness of instructors or methods of instruction and the relative ability of the students to learn.

The base of fire of a rifle platoon is its automatic weapons. The riflemen concentrate their fire on the impact area blocked out by the automatics. The base of fire of a United States rifle squad in this war has been its Browning automatic rifle. Prior to the war the Army had several hundred thousand of these weapons in war reserve. The developments of the war indicated it might be well to replace the automatic rifle with another type of small automatic weapon, but if we had, we would have jammed production facilities, replacing a type of weapon already in stock. Instead, it was decided to modify the automatic rifle and devote production to the Garand rifle.

The Germans, on the other hand, shifted their rifle squad automatic weapon to a new type of light machine gun developed just before the war. Their standard rifle at the end of the war was still bolt-operated. They had produced a few semi-automatic rifles but they were never effective and did not reach the battlefield in number. In their efforts to improve the firepower of their infantry, the Germans then beat us to quantity production of the machine pistol, which we did not have in large numbers on the battlefield until well near the end of the European war. Our superiority in infantry firepower, stemming from the use of the semi-automatic rifle, was never overcome.

General of the Army George C. Marshall

Surgical Lag

COLONEL JOSEPH RICH, *Medical Corps*

The smoothness and efficiency which so characterized the functioning of the medical service during World War II minimized the number of casualty evacuation problems requiring attention by the General Staff. As a consequence, the complexity of the casualty evacuation plan is seldom fully appreciated. The following article will provide the reader with an interesting glimpse of the Surgeon's backstage arrangements implementing the evacuation plan. The analytical reader will perceive that an important keystone to the entire plan is fast reliable signal communications.—THE EDITOR.

Historical Data

THE proper care of battle casualties in the Army area is dependent upon the number of skilled surgical teams available and the sorting and distribution of patients so that each patient will receive proper surgical treatment as quickly as possible after injury. In general, two types of casualties are involved, non-transportables, which require comprehensive surgical care quickly and as near as possible to where they fell and transportables, which can be evacuated to the rear. For the former we have our mobile and portable surgical units and distribution presents no problem in that these units are normally located at and serve only one Division Clearing Station. The distribution of transportables is a problem.

Soon after D-day in Southern France, the Surgeon, Seventh Army, met with the Surgeon, VI Corps, to determine a better method of casualty distribution from Division Clearing Stations to Army Evacuation Hospitals. Methods in use had failed due to a rapidly moving situation which presented a D+65 tactical situation versus a D+10 unit arrival situation. Medical service was spread critically thin.

The Surgical Consultant presented the following as his experience and the experience of the Chiefs of Surgical Services in Evacuation Hospitals assigned to Seventh Army:

Period which the average moderately to severely wounded patient may be held unoperated upon without complication or retardation of recovery—zero to six hours.

As a result of the above and the VI Corps Surgeon's insistence that surgery determine distribution of patients, it was decided that distribution was to be made upon the basis of the question "Can the patient be gotten to surgery in less than six hours?"

From that beginning, the concept of Surgical Lag and its use in Seventh Army, was evolved.

Surgical Lag

Definition.

The time expressed in hours, required for a hospital to complete the surgery required on all moderately to severely wounded or injured casualties.

Determination.

An estimate, made by the Chief of the Surgical Service of the hospital or a competent assistant chosen by him, based upon physical examination of the casualties present and remaining unoperated.

Purpose.

A factor used in an attempt to bring every casualty to competent surgery in less than six hours time, beginning with the patient's clearance from the Division Clearing Station.

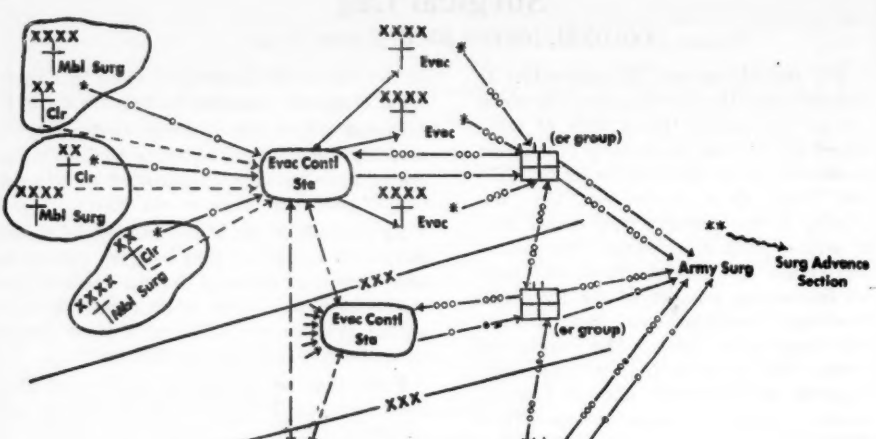
Organization for Use.

See Chart page 48.

Illustration.

Seventh Army, consisting of two Corps, disposed as shown on map page 49, slowly advancing and preparing for maximal effort toward Rastatt, Germany, about 10-15 November.

Clearing XV Corps is the 56th Medical Battalion Evacuation Hospitals designated to receive patients from this Corps, the 11th, 400-beds, and the 51st and 59th Evacuation Hospitals, 750-beds each (note



Legend:

Patient flow:

Automatic — — — —

Controlled through the Evacuation Control Station Officer of the Med Bn or Gp designated to clear the particular Corps ————

Controlled by Army Surgeon. When hospitals in one Corps are overburdened by casualties and a high Surgical Lag results in all of them, the Bn or Gp clearing that Corps will apply to the Army Surgeon for permission to evacuate his patients through the Evacuation Control Station of another Corps whose supporting hospitals have a low Surgical Lag —— — ——

Liaison:

* Enlisted men from the medical battalion or group clearing the Corps.

** Officers from the Surgeon's Office, Advance Section.

Reports:

Casualty flow, current and anticipated. Made every four hours or more frequently depending upon the situation —— o ——→

Surgical Lag and Vacant Beds. Made every four hours or more frequently depending upon the situation —— ooo ——→

Air, Rail, Motor evacuation requirements ~~~~→

that the 59th Evacuation Hospital, though designated for XV Corps, lies in VI Corps area).

Clearing VI Corps is the 52d Medical Battalion Evacuation Hospitals designated to receive patients from this Corps, the 95th and 93d, 400-beds each and the 9th and 27th Evacuation Hospitals, 750-beds each.

Evacuation Hospitals, 7501-1 and 400-beds used identically.

Surgical Lag and Vacant Bed reports every four hours.

Medical Groups not used.

Roads paved and in good condition.

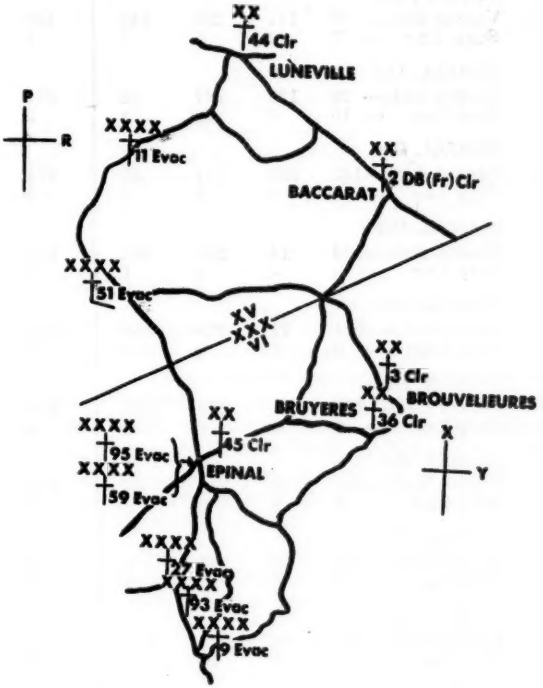
Using the situation as outlined and the above reports it can be seen that midnight

23-24 October, a surgical patient cleared from the 44th Division Clearing Station at Lunéville would have traveled fourteen miles to the 11th Evacuation Hospital, twenty-four miles to the 51st Evacuation Hospital or thirty-seven miles to the 59th Evacuation Hospital. These hospitals all had vacant beds but the case would have waited thirty hours at the 11th, six hours at the 51st and two hours at the 59th Evacuation Hospital before he received surgery. An evacuation control officer of the 56th Med Bn using vacant beds as his distribution factor, would have sent his patient to the 51st Evacuation Hospital. The trip would have taken approximately one hour and a quarter but upon arrival the patient would have waited at least four and a half hours. Using Surgical Lag as the distributing factor, the evacuation control officer would have sent his patient to the 59th Evacuation Hospital. The trip would have taken approximately two hours over good roads and the patient could have gotten surgery immediately upon arrival.

Normally distances between Division Clearing Stations and Army Evacuation Hospitals are much less than those shown in the above situation. Surgical Lag in a normal situation does not have to compete with the threat to a patient by long ambulance hauls.

Looking at the report for midnight 24-25 October it can be seen that a patient from the 2d Armored Division (Fr) Clearing Station at Baccarat, approximately equidistant from all three hospitals serving the Corps, would have gone to the 51st Evacuation Hospital if vacant beds were the criteria for distribution. He would have waited approximately seventeen hours after arrival, however, before surgery could be done. With Surgical Lag as a criteria the patient would have gone to the 59th Evacuation Hospital and gotten his surgery immediately upon arrival.

The report for midnight 25-26 October shows that of the hospitals serving VI Corps, only the 95th had a Surgical Lag of less than six hours, but it had a total of only 32 vacant beds. An evacuating officer using



Surgical Lag as the distributing criteria would have chosen from incoming casualties those requiring the longest time at operation and he would have sent them to the 95th Evacuation Hospital. In so doing he would be making maximal use of the operating teams available for the number of vacant beds available and thus increase the number of cases that other hospitals with more beds could handle. Thus the hospital with the least number of beds in this case would perhaps be getting the first cases after midnight.

Midnight Reports.

	VI Corps				XV Corps			
Evac Hosp	*9th*	*93d*	*27th*	*95th*	*59th*	*51st*	*11th*	
232359A, Oct								
Vacant Beds—	85	99	292	165	285	391	87	— Total 1404
Surg Lag —	0	0	3	1	2	6	30	
242359A, Oct								
Vacant Beds—	87	141	268	140	136	269	152	— Total 1393
Surg Lag —	3	4	5	1	1	18	15	
252359A, Oct								
Vacant Beds—	20	123	277	32	241	301	147	— Total 1141
Surg Lag —	10	6	10	2	2	2	4	
262359A, Oct								
Vacant Beds—	142	129	311	80	174	277	166	— Total 1279
Surg Lag —	0	4	0	2	5	1	2	
272359A, Oct								
Vacant Beds—	120	74	287	161	192	326	210	— Total 1370
Surg Lag —	0	4	4	1	1	2	1	
282359A, Oct								
Vacant Beds—	211	72	278	159	172	419	279	— Total 1590
Surg Lag —	0	0	8	2	2	0	0	
292359A, Oct								
Vacant Beds—	284	31	265	132	225	452	263	— Total 1652
Surg Lag —	0	0	1	2	4	1	2	
302359A, Oct								
Vacant Beds—	406	62	211	64	175	435	239	— Total 1592
Surg Lag —	0	5	8	2	4	1	2	
312359A, Oct								
Vacant Beds—	519	83	286	0	94	444	211	— Total 1637
Surg Lag —	0	0	11	9	6	5	8	
012359A, Nov								
Vacant Beds—	597	78	218	109	51	399	220	— Total 1672
Surg Lag —	0	0	12	3	3	6	2	
022359A, Nov								
Vacant Beds—	673	0	190	61	180	357	219	— Total 1680
Surg Lag —	0	8	3	2	10	7	2	
032359A, Nov								
Vacant Beds—	*	37	151	78	57	300	237	— Total 860
Surg Lag —		6	7	6	5	8	2	
042359A, Nov								
Vacant Beds—	*	89	118	0	55	278	233	— Total 773
Surg Lag —		6	6	12	2	3	4	
052359A, Nov								
Vacant Beds—	*	74	210	151	115	283	246	— Total 1079
Surg Lag —		5	10	1	5	0	2	

* Closed—Moving

Midnight 4-5 November, the 9th Evacuation Hospital serving VI Corps was closed and moving to Lunéville. VI Corps had vacant beds in only the 93d and 27th Evacuation Hospitals, each with six hours Surgical Lag. An evacuating officer, through his battalion, would have notified the Army Surgeon and requested permission to send incoming patients to XV Corps Hospitals, preferably the 59th. In such a situation it was standard operating procedure for the Army Surgeon to grant the request and for the requesting battalion to make close liaison with the battalion clearing the other Corps so that the average Surgical Lag in the hospitals of his opposite number was not raised above that in his own Corps.

Date	*No of Evac Hosp open both Corps*	*Total Battle Casualties received—24 hr period*	*Av Surg Lag end of period*
23 Oct	7	244	6
24 Oct	7	203	6½
25 Oct	7	281	5
26 Oct	7	192	2
27 Oct	7	169	2
28 Oct	7	310	2
29 Oct	6	218	1½
30 Oct	6	260	3
31 Oct	6	301	5½
1 Nov	6	192	4
2 Nov	6	166	4½
3 Nov	6	219	6
4 Nov	6	250	7

Surgical Lag Versus Vacant Beds

"The bed capacity of a military hospital is limited only by the ingenuity of its Commanding Officer." Vacant beds have no bearing upon whether a patient will live or die or get back to his unit at an early date. In the midnight reports shown (page 50) a cursory glance should quickly reveal that vacant beds should be considered only after it has been determined that the patient can be placed into that bed with surgery completed in time to prevent complications and retardation of recovery.

Surgical Lag Versus the Number of Casualties

Distribution of patients cannot be made by number, that is, fifteen to the 95th, the next fifteen to the 93d and so on. To illustrate the fallacy of distribution by numbers the figures are reproduced from records in the Office of the Surgeon, Seventh Army.

Note that with seven hospitals open on 23 October, at the end of the twenty-four hour period 244 battle casualties had been received and each hospital still had an average of six hours of surgery remaining to be completed, yet on the 24th with the same number of hospitals in operation and only 203 cases received there was more surgery remaining in each hospital and on the 25th with more cases received than on either the 23d or 24th there was less surgery to do at the end of the period.

On 31 October with six hospitals in operation and 301 battle casualties received there was a five and a half hour lag as compared to four and a half for 2 November with the same number of hospitals and approximately half the number of casualties received.

If two similar type hospitals, each with no surgery remaining to do at a certain time, were given fifteen cases each and told to report when surgery was completed, they would probably report from one hour to five hours apart. There are many reasons for such a variance. One of them is fatigue. Note in the table below the differences resulting from fatigue and a build up of minor factors, too numerous to mention.

Number of operations which can be performed per hospital during various periods (Seventh Army experience):

Period	*Number of operations 750-bed Evac Hosp*	*Number of operations 400-bed Evac Hosp*
24 hour spurt	100-110	90-100
One week steadily	75-80	60-75
Two weeks steadily	75-80	50-60
One month steadily	50-60	30-40
Indefinitely	45-55	30-35

Ill anesthetists or the illness of a key surgeon might cut the productivity of the hospital. Different types of action produce different types of wounds such as an attack through a mine field as compared to holding action in a wooded area. Differences in hospital locations, opening and closing of units,

all tend to affect the amount of surgery that can be done from day to day and from hour to hour.

Conclusion

Should the distribution of great numbers of battle casualties ever again become a necessity, it is sincerely recommended that Surgical Lag be employed as the distributing criteria. The general consensus among Commanding Officers of Seventh Army Medical units (many of which were able to draw upon their experience in Tunisia, Sicily and Italy, as well as in France and Germany) was that this type of distribution was the best for the patient.

I believe that strength is necessary in support of good works, just as strength has been applied in the furtherance of wicked aims in the world. We gained a great victory over the Axis powers in this war, but there are still enemies abroad, external and internal, because when you come down to it, the seeds of war are in the breast of each of us. None of us, as a citizen or as an official of his government, can escape his responsibility for understanding that within him is a certain amount of greed, a certain amount of selfishness, a certain amount of prejudice. Those things are not going to be eradicated from our breasts within our time, but we can find ways to control them, to turn them to practical use, so we can get along together.

In this great world problem I think that the Americas have an unusual opportunity in this. I believe that in the Americas more than in other countries are still remaining those shreds of the pioneering spirit that brought our forefathers into every country of the Americas from Europe. They did not have someone to take care of them. They had to take care of themselves. That pioneering spirit, that determination to go and live their lives as they please which, as I understand it, is at the basis of our understanding of democracy, is still with us in great measure. If we can take those assets that we have of that type, work with them and develop them as brothers, and with the certainty that we are going to remain in peace among ourselves to develop our own idea of world peace, then we will be doing a great deal for ourselves and for the whole world.

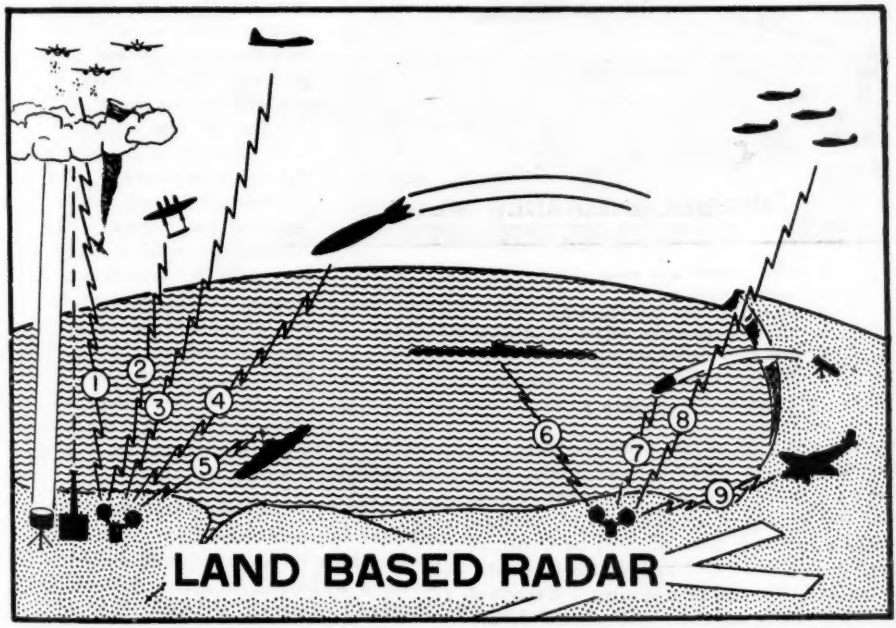
General of the Army Dwight D. Eisenhower

Radio Countermeasures

LIEUTENANT COLONEL CECIL C. McFARLAND, *Air Corps*
Former Instructor, Command and General Staff School

THE use of radio and radar by all the arms and services has increased to the point of marked dependence. From the most trivial mission of a single airplane or tank to the intricate combined operation of a continental invasion, radio communication and radar detection served as the eyes and ears of the commanders. The usefulness and the reliance of radio and radar increased proportionately with their development; until the final stages of World War II closely approached the stage of an "instrument warfare" where nearly all but small caliber fire was controlled from instrument panels rather than visual aiming.

Whenever radio devices receive proper waves, they fulfill their designed purpose, but if countermeasure activity can introduce interference or deceptive information into them their usefulness diminishes. In modern warfare the one who is denied reliable radio and radar facilities is greatly handicapped. Radio Countermeasures (RCM), which includes radar countermeasures, are valuable weapons against enemy equipment and can be used to a decided advantage especially during an offensive.

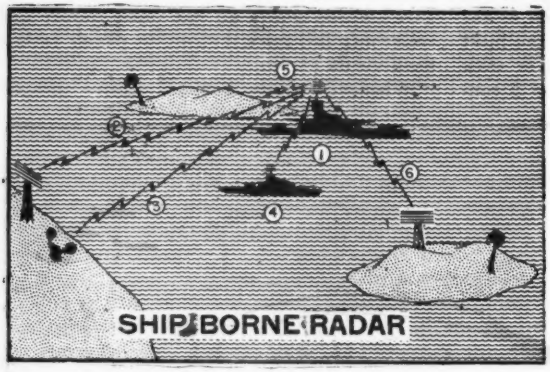


1. Gunlaying (GL) and Searchlight Control (SLC) on unseen enemy aircraft.
2. Ground Control Interception (GCI) of friendly fighters on enemy targets.
3. Identifying aircraft (and surface vessels) as "Friend or Foe" (IFF).
4. Tracking (and gunlaying) rockets and jet bombs.
5. Guiding friendly surface craft close to shore.
6. Spotting enemy surface vessels and submarines.
7. Tracking mortar trajectories to determine origin.
8. Early warning (EW) of approach of enemy aircraft.
9. Ground Controlled Approach (GCA) to land aircraft in zero visibility.

Figure 1.

Radio Countermeasures became a natural

corollary to the development of the military use of radio and radar; it joined that vicious circle of: better arms—better armament—counter defense—better arms—and on and on. The adage of an old wrestling instructor has again been proved, "For every hold, there's a guard agin' it!" It becomes obvious that the stepped-up development of scientific warfare demands that all must be aware of the capabilities of each new device, its limitations and its countermeasures. Technical volumes, many of them still classified, are available for those who wish to delve into the complex nature of electronics, but the fundamentals of radar and radio countermeasures are herein presented without the technicalities.



1. Same as land based radar, plus:
2. Loran navigation.
3. Replying to IFF Interrogation.
4. Close ship formation in fog or at night.
5. Close shore navigation in fog or at night.
6. Beacon navigation.

Figure 2.

Basic Radar

The radar (radio detection and ranging) set is fundamentally a radio transmitter, a receiver tuned to the same frequency and a cathode ray tube. The transmitter sends out a pulse of very short wave length; this pulse reflects back from most any substance very much the same as light waves; the strength of the pulse that rebounds to the vicinity of the transmitter varies with the texture, contour, size and matter of the substance, again quite comparable to light reflections. The receiver, which is adjacent to the transmitter, transposes these returned pulses into a visible pattern on the cathode ray tube or "scope"; this visible interpretation of the area scanned by the radar will vary from a slightly distorted plan map on the Plan Position Indicator (PPI) scope (Figure 4), to a dot or a "pip" indicating the presence of an object in the scanned area as in the "A" type and the "B" type scopes.

By measuring the time lapse for the pulse to travel from the transmitter to any specific object and back again to the receiver, the cathode tube can transpose this time to a proportionate distance on the scope. In similar manner the direction of the pulse return can be transposed to indicate the relative bearing of the object on the scope. We have then a visual indication of the characteristics, the range and the azimuth of a selected target.

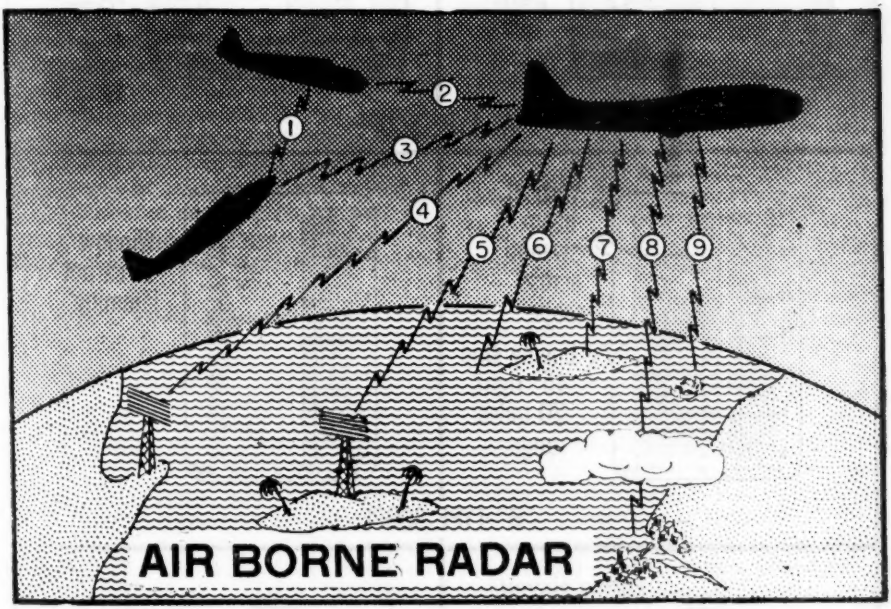
Uses of Radar

Radar can be classified by the medium on or in which it operates—land based, shipborne or airborne. Assuming that no interference or jamming is being practiced, the radar field has wide capabilities and offers a menace in both defensive and offensive operations. The diagrams (Figures 1, 2, and 3) show some of the common uses of radar.

Radar Countermeasure Fundamentals

By diverting the radar's transmitted pulses, by sending false or confused signals or pulses to the radar's receiver, or by introducing material that will give deceptive returns to the radar's receiver, it is possible to render the radar set unreliable, deceptive or even inoperative; this is the job of Radio Countermeasure Teams—to confuse or deceive the radar operator and so render the equipment useless in its designated purpose. The Allies

were fortunate in gaining the lead in radar development; consequently we were ready to cope with the first types of enemy radar that were used. However, a continuous study of enemy electronic devices was necessary to keep our countermeasures a jump ahead of the enemy's operating equipment; when the Germans put a new set in the field, we had to be ready to jam it immediately—in this, we were quite successful.



1. Air Interception (AI) of enemy aircraft.
2. Detection of enemy fighter and gun control.
3. Identification of friendly fighter.
4. Replying to IFF Interrogation.
5. Loran or beacon navigation.
6. Accurate altimeter.
7. Fixing position by identifying obscure landmarks.
8. Bombing through overcast (BTO).
9. Locating survivors afloat.

Figure 3.

RCM equipment used to disrupt radar operations varied considerably in technique but they can all be classed under four general types known best by their codes names as:

1. *Ferret:* A small "snooper" receiver carried in an aircraft, jeep or pack. It searched all the known frequencies that enemy radar were using. By analyzing the signals, the set was capable of accurately locating enemy equipment, determining its frequency, estimating its output strength, and determining the type of equipment. This equipment was necessary for the fast development of adequate countermeasures; it "G-2ed" the enemy and gave a basis for defensive measures.

2. *Window:* Any of the various strip-type "reflectors" that caused false indications on the scope of the enemy radar. *Chaff* is small strips of aluminum or tin foil cut to a length that harmonizes with the wave length of the enemy radar. *Rope* is long (400 feet) strips of aluminum foil with a small parachute attached. Window was usually dropped from aircraft, but it was also fired in mortar shells, dropped in bombs and dispensed from captive balloons.

3. *Carpet:* Small transmitters that were tuned to a specific frequency of an enemy radar set (spot jamming) or swept over a

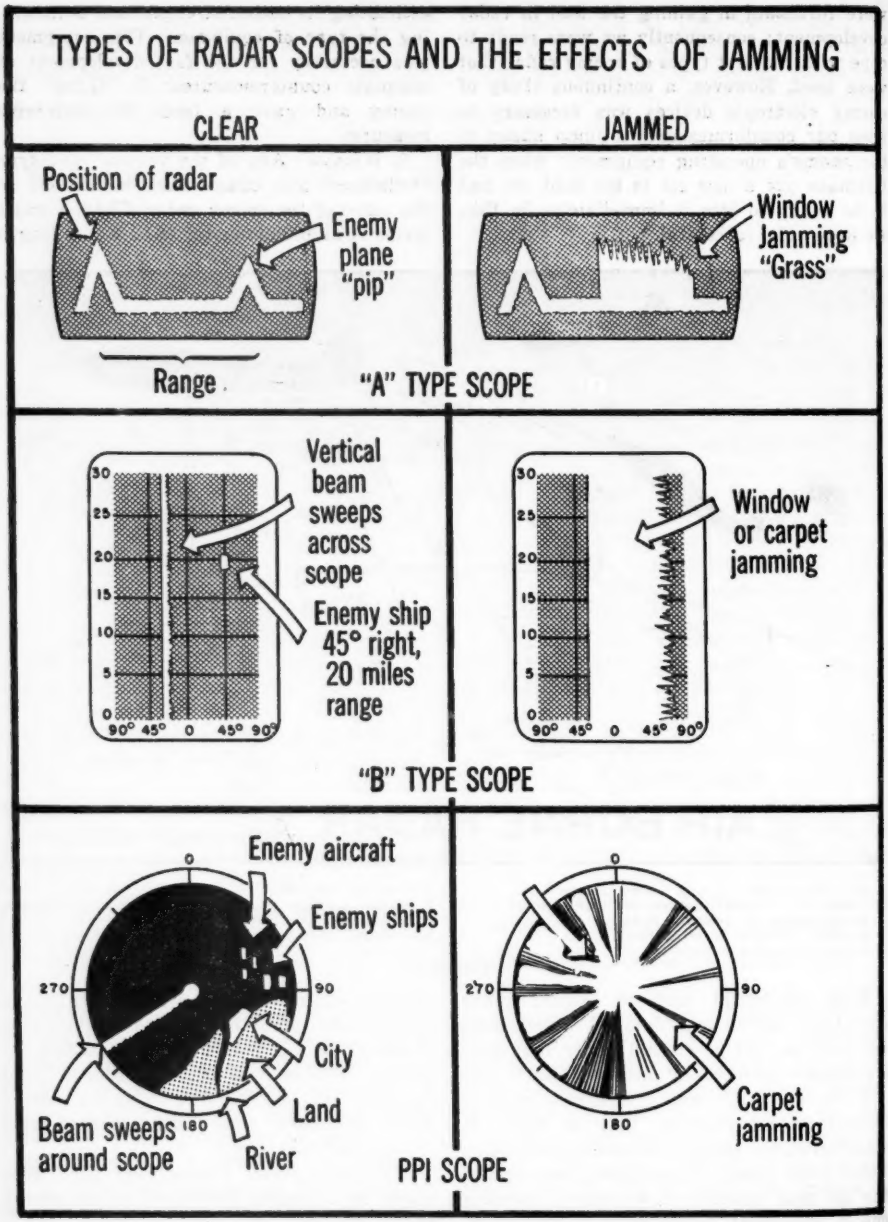

TYPES OF RADAR SCOPES AND THE EFFECTS OF JAMMING
CLEAR
JAMMED
Position of radar
Enemy plane "pip"
Range
Window Jamming "Grass"
"A" TYPE SCOPE
Vertical beam sweeps across scope
Enemy ship 45° right, 20 miles range
30
25
20
15
10
5
0
90° 45° 0 45° 90°
Window or carpet jamming
"B" TYPE SCOPE
Enemy aircraft
Enemy ships
City
Land
River
Beam sweeps around scope
0
90
180
270
Carpet jamming
PPI SCOPE

Figure 4.

band of frequencies (barrage jamming). These sets emitted "static," noise or false signals to confuse or deceive the radar operator.

Radar operation and scope interpretation are jobs for specialists. It is no simple matter to tune a radar set, adjust all of the knobs precisely, orient the base line and finally identify a small blob of light or a pip as a friendly aircraft or an enemy vessel. Imagine, then, the consternation of the operator when, in the midst of this tedious task, he suddenly encounters a scope flash (carpet interference) or a window cloud (Figure 4) that disrupts his readings. Jamming, however, does not render all radar obsolete. A well trained operator can differentiate intentional from unintentional interference; he can even identify the type of interference and so adjust his instrument to diminish the jamming effect and, unless the interference is particularly heavy, he can "read through" to identify his target.

Radio Jamming

Introducing radio interference seems quite simple when we note the amount of "static" that can be picked up on the family radio when someone in the neighborhood is using an electric razor, or when there is a thunderstorm in the area. But, in the field, radio jamming is no simple task. Radio nets can change quickly to alternate frequencies which makes them elusive. We must be careful not to jam our own frequencies—exact radio frequencies are difficult to detect, and superhetrodyne and static arrestor developments have gone far in eliminating unwanted radio interference; but radio countermeasures have not been found lacking in developing desired interference. Major combat elements in land, sea and air warfare have radio interceptor teams that monitor the enemy's radio frequencies; these teams either glean valuable information from the enemy's messages or they tabulate the radio frequency for future jamming. If the intelligence section determines that the enemy is getting more good from his own radio than we are, a transmitter is tuned to the enemy's operational frequency and a continuous howling or squeaking noise is introduced that disrupts the entire net. This necessitates a change in the net frequency—the new frequency must then be jammed. During the last war many of the commercial frequencies were jammed to confuse and to dishearten all concerned. Some of the jamming systems used on both combat and commercial frequencies were:

1. *Bagpipe:* A transmitter with a sound modulator, set to a specific frequency. This set needed practically no attention and it developed a variable-pitch tune that drowned out normal voice broadcasts. The tune resembled a mad Scotsman on a bagpipe—hence the name.

2. *Chatter:* A receiver and transmitter that was tuned to the enemy's frequency allowing our operator to break in verbally on the enemy's broadcast to give false direction, to hackle the broadcaster or to garble the broadcast.

3. *Barrage Jamming:* A transmitter that put out interference on a set band of frequencies to jam all transmission in that band. Care had to be taken to avoid any frequencies used by our own troops in that area.

4. *Spot Jamming:* A transmitter with a noise maker plugged in that could be quickly tuned to any enemy frequency intercepted. A skilled operator could jam several frequencies simultaneously.

It is normally easier to develop new countermeasure equipment than it is to change the operational organization or equipment of radar and radio units. And so, the battle goes on: radio and radar *vs* countermeasures; and when the experimental developments now in the making come into the game, it should be very interesting.

Twice the United States has had to send millions of its young men to fight a war, but now war can find any nation between dusk and dawn.

Winston Churchill

Logistics As Seen From a Corps Level

LIEUTENANT COLONEL J. W. SMITH, *Corps of Engineers*
Instructor, Command and Staff College

In this article the supply and evacuation functions as experienced by the II Corps in operations in Tunisia, Sicily and Italy are briefly discussed. Several points are discussed and a few instances cited where it was necessary to modify the procedures normally taught to insure logistical support of the corps. As a result of these operations certain conclusions are drawn that in the opinion of the writer, should be considered in future operations of a corps G-4 section.—THE AUTHOR.

ARMY field manuals set up a corps headquarters as a tactical organization which is responsible for the tactical employment of the divisions and corps troops under its command. Insofar as supply responsibilities are concerned, corps is normally bypassed except for the allocation of ammunition. This is further substantiated by the teachings at various army schools.

Of course there are exceptions to this doctrine, such as a corps taking part in an amphibious operation, or when it is sent on a special operation such as the II Corps experienced in the Tunisian Campaign of 1943. Regardless of the type operation in which a corps may become involved, the G-4 section must be organized and trained to insure logistical support to all units of the corps. Whether or not a corps becomes involved in supply and evacuation functions depends on several things such as tactical employment, terrain, ability of higher headquarters to provide logistical support, speed of advance, and to a certain extent the personalities of the corps and army commanders.

During the Tunisian Campaign in 1943, II Corps was an independent American corps under the tactical command of The First British Army. For supply and evacuation the corps was initially supported by Mediterranean Base Section at Oran and later by Eastern Base Section of Constantine. All supply points, depots, maintenance, and evacuation, which would normally be under army control, were under control of II Corps. The various supply, maintenance and evacuation installations were in a sense "commanded" by the respective corps special staff officers. Since II Corps was to be the "Experimental Corps" for World War II against the European Axis Powers, all eyes were turned toward Tunisia. Although many difficulties were encountered and mistakes were made on the logistical side of the ledger, there were also many lessons learned and policies set up which were later adopted by other corps and armies. Several of these deserve special mention: A battle loss replacement pool of ordnance equipment was set up for immediate replacement of battle losses. In the case of tanks the replacements included trained crews if needed; it was found that "B" rations could be issued to the majority of the combat and service units in a much higher percentage than had originally been planned; and one of the outstanding lessons learned was that a corps could not operate efficiently with the supply special staff officers in the rear echelon of the headquarters, which at times may be as much as thirty to forty miles to the rear. As it was not desirable to have the forward echelon too large, a third echelon (the supply echelon), of the headquarters was formed which normally was never more than five miles from the forward CP. This echelon was commanded by the G-4 executive, and consisted of the six supply sections. The chemical warfare, engineer, and signal sections were split with the supply elements of each in the supply echelon, and the tactical elements of each in the forward echelon. The creation of this third echelon, of course caused additional communication problems, but these were greatly outweighed by the benefits claimed.

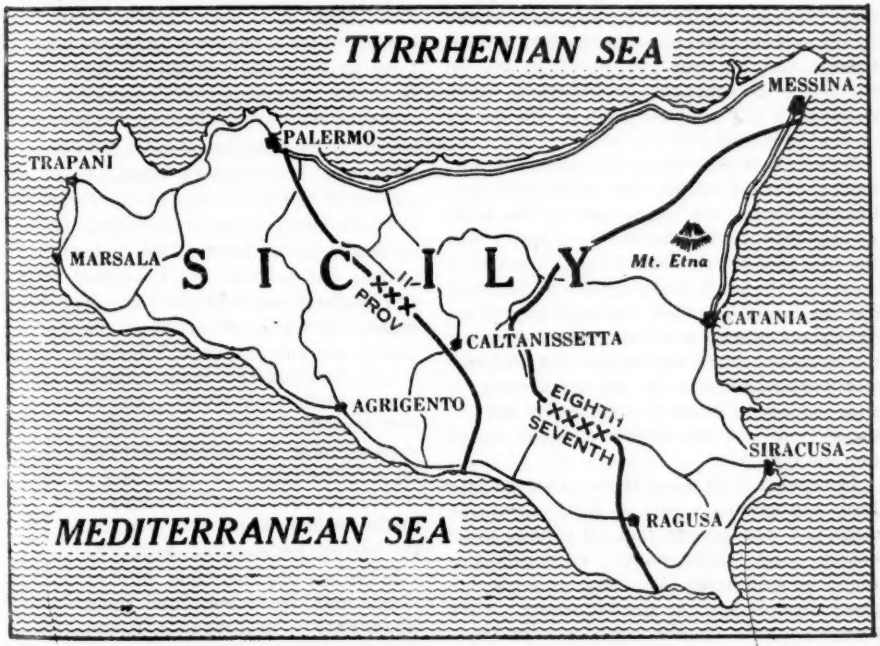
When II Corps, then a part of the Seventh Army, landed on the southern shores of

Sicily, the G-4 section was looking forward to a relatively pleasant and happy campaign, because for the first time during World War II, the corps was to operate as a "type" corps and would not have the responsibility of supply and evacuation functions. This "day-dreaming" did not last long.

After severe fighting on and near the beaches during the first few days the advance inland to the north coast became more rapid. During this period the ordnance maintenance and medical evacuation in support of the corps had not proven satisfactory, and upon insistence of the corps G-4 and concurrence by the army G-4, the responsibility for both was delegated to corps.

Under corps control, with better communications and less reaction time, better flexibility and positive control of units was possible, and the maintenance and evacuation support was soon improving rapidly. Upon reaching the north coast the corps turned eastward toward the straits of Messina. By this time, D+13, the divisions and corps troops had stretched their supply lines to the breaking point as they were still hauling supplies from the beaches on the south coast. The supply of gasoline and ammunition had become critical. All *supply* functions had remained under army control. The enemy decided to put up a stubborn defense around Troina and the expenditure of artillery ammunition was becoming greater and greater. Ammunition supply points that were established to support the corps contained unbalanced stocks and units were still required to go back to the south shore for many types of ammunition. This same difficulty was also encountered in the supply of gasoline. With a breakdown in the logistical support of the corps facing the corps G-4, it was apparent that certain "not in the book" tasks were necessary.

A brief conference was held between G-4 and G-3 and upon approval by the Chief of Staff, certain tactical units were deprived



of their transportation except that necessary for housekeeping purposes. Provisional truck companies were formed and sent to the beaches on the south coast for ammunition and gasoline. By continuous hauling (twenty-four hours per day) for a few days, the supply of gasoline and ammunition became less critical. The round trip distance traveled by these companies was from 150 to 200 miles over narrow mountainous, dusty roads which in many places would support only one-way traffic. The supplies hauled by corps transportation together with those being hauled by army transportation enabled the corps to maintain the offensive which resulted in the complete rout of the enemy a few days later.

During this time when the corps G-4 was having his difficulties, the army G-4 was likewise having his share. One of the main reasons for the breakdown in supplies was the fact that the Seventh Army did not have a port on the south coast capable of handling the necessary supplies. Consequently practically everything was being carried across the beaches. After the capture of Palermo and Termini-Imerese on the north coast, it was possible to bring in supplies by boat to these ports and the supply situation eased considerably.

In October 1943 when II Corps moved into Italy and became a part of Fifth Army the corps G-4 was advised that all supply, evacuation, and maintenance responsibilities would be with army. An ordnance bomb disposal squad and a quartermaster truck company made up the corps service troop list, initially. Pack mules companies and a quartermaster service company were later added. The type of warfare that followed for the next few months was one of slow movement and defensive operations preparatory to a general offensive in the spring. During this phase of the campaign little difficulty was encountered in supply, evacuation, and maintenance. The corps G-4 section had continued the policy of operating in two echelons (supply and forward) which had proved very successful in northern Tunisia and Sicily.

In early spring of 1944 practically all units under command of Fifth Army were reorganized under new T/O's & E's. All units under command of II Corps being reorganized were required by Fifth Army to submit their recommended changes in T/O's & E's, and to request excess equipment through command channels. During a period of approximately three months, the full time of two officers and one enlisted man of the G-4 section was devoted to processing these recommendations and requests. Recommendations from each corps special staff officer concerned were required. These recommendations were carefully studied by the G-4 and in many instances were included in the recommendations of the corps headquarters.

This reorganization of units did not except the corps headquarters itself. Upon completion of reorganization of the corps headquarters, the G-4 section, including the traffic section, was authorized the following personnel: one colonel; one lieutenant colonel; two majors; one captain; one master sergeant; one technical sergeant; one staff sergeant; and one sergeant. Other staff sections in the headquarters were likewise reduced in personnel. After studying the organization and equipment of the G-4 section and the various supply special staff sections, and looking into the future as to the types of warfare to be expected, several changes were made in the corps headquarters that would insure the best of logistical support.

It became apparent that with reduced personnel and equipment, the supply echelon would have to be disbanded. However, it was still necessary for all supply special staff officers to keep abreast of the situation at all times, and it had been conclusively proved before that these staff officers could not perform their work efficiently if they remained in the rear echelon of the headquarters.

On 11 May 1944, when II Corps consisting of the 85th and 88th Infantry Divisions plus normal corps troops, jumped off on the attack that resulted in the total defeat of the enemy and the fall of Rome, the organization of the headquarters for logistical support was as follows:

1. *Forward Echelon:*
   - *a.* Entire G-4 section including traffic section plus one T/sergeant borrowed from ordnance section.
   - *b.* Entire signal section.
   - *c.* Entire engineer section.
   - *d.* Entire chemical warfare section.
   - *e.* Corps quartermaster and one enlisted man.
   - *f.* Corps surgeon, assistant surgeon and one enlisted man.
   - *g.* Ammunition section of ordnance.
2. *Rear Echelon:*
   - *a.* Balance of quartermaster section.
   - *b.* Balance of surgeon section.
   - *c.* Balance of ordnance section.

Within the G-4 section the organization was as follows:

1 Colonel, G-4.

1 Lieutenant Colonel, Executive.

1 Major, Operations and Planning Officer.

1 Major, Traffic Control Officer.

1 Captain, Administrative and Assistant Traffic Control Officer.

1 Master Sergeant, Chief Clerk.

1 Technical Sergeant, Assistant Chief Clerk and Typist (borrowed from ordnance).

1 Technical Sergeant, Traffic Control.

1 Staff Sergeant, Traffic Control.

1 Sergeant, Stenographer.

The G-4 section was made completely mobile, including the traffic control office which was built on a captured enemy trailer. Regardless of the speed of advance the G-4 section was always in communication with the divisions and corps troops. Upon displacing forward, usually the G-4 went ahead leaving the executive to carry on the G-4 duties until communications were established at the new CP when the G-4 would notify the executive to move forward.

The organization of the logistical sections of the headquarters as described above had many advantages which were later proved in the rapid advances of the corps prior to the complete collapse of the Germans in Italy. By locating these key logistics personnel in the forward echelon they kept abreast of the situation at all times. The reaction time was less, the flexibility greater. The headquarters was always able to give maximum logistical support to troops of the corps regardless of the type of warfare encountered.

In the rapid advance of the Fifth Army, spearheaded by II Corps, from the Garigliano River to the junction with the Anzio beachhead and capture of Rome, the logistical support given by army was much better than had been experienced in Sicily. Upon insistance of the corps G-4, another quartermaster truck company, two in all, was attached to the corps. However, here again it was necessary to deprive certain tactical units of their transportation to assist in hauling both gasoline and ammunition to the combat troops. In addition to the hauling of supplies at times G-4 also had to furnish G-3 with sufficient trucks to motorize from one to two battalions of infantry. Due to the rapid advance of the divisions the communications between corps and the supply services of army were completely severed, and army had to be requested to establish supply points for support of the corps.

Initially, upon coming under command of Fifth Army, the divisions under II Corps dealt directly with army in all supply matters except ammunition. This, however, did not prove satisfactory, because the supply services in the rear echelon of army are not at all times familiar enough with the tactical situation to locate properly all supply installations. Of course the divisions are always anxious to get the supplies as far forward as possible, and would like to have an army Class III filling station at their quartermaster company bivouac area.

The policy of establishing supply points was changed. Upon agreement between the army and corps G-4's an army SOP for establishing supply points was set up in which no supply point would be established without the approval of the corps G-4. This method proved to be the best solution. By working closely with the corps G-4, the saving in labor and transportation became quite apparent. The Corps staff is more familiar with

the immediate tactical situation, and can thus give sound recommendations best to support the entire corps logistically. Many times one supply point may be established to support two divisions instead of one for each division, thus serving the same purpose and at the same time saving troops, labor, transportation and time.

The same policy as set up for the establishment of supply points was likewise established for the allocation of many controlled items of equipment. This policy also proved to be excellent mainly because the corps is more familiar with the present and future tactical operations which confront the corps as a whole.

The above paragraphs list only a few of the problems which confronted the II Corps G-4 in the campaigns in Tunisia and Sicily, and in the Italian Campaign up until 26 February 1945. Several instances were cited when it was necessary to take actions that are more or less exceptions to our military teachings and doctrines. In all cases the action taken proved to be justified.

In conclusion, in the opinion of the writer the following points if adopted, would greatly improve the logistical support of a corps in future combat operations.

1. The main reason for the existence of the logistics section of a higher headquarters, such as corps or army, is to serve the troops under command of the headquarters, and *not* be served by its troops. In other words, don't try to have a "happy headquarters" at the expense of the troops under command of that headquarters.

2. Personal contact between divisions, corps and army staff officers is essential for good fellowship and understanding as well as good logistical support. It is suggested that corps SOP's include staff visits by a G-4 staff officer to each division and army at least once each week, and to corps troops at least twice monthly.

3. The entire G-4 section of a corps should be in the forward echelon and should be completely mobile.

4. Corps special staff officers concerned primarily with logistics should be located in the forward CP of the headquarters to insure proper logistical support.

5. All supply, maintenance and evacuation installations in support of a corps should be coordinated through the corps G-4 and have his approval, prior to their establishment.

6. The allocation of major controlled items of equipment should be made only upon the approval of corps.

7. A quartermaster service company or similar type unit should be an organic part of a corps in combat. A unit of this type can more than pay for itself in the collection of salvage alone.

8. Corps should have a more positive control over the ammunition supply, and consideration should be given to making the supply of ammunition a corps rather than an army function.

9. If, in a future war the corps headquarters is still considered tactical and is not charged with supply, maintenance, and evacuation functions, the corps G-4 must be prepared at all times to assume these responsibilities, because he cannot tell his commander that an operation cannot be supported, when the G-4 knows in his own mind that *every effort has not* been exhausted.

Another war would strike much more suddenly than the last, and it would strike directly at the United States. We cannot expect to be given the opportunity again to experiment in organization and in ways of teamwork while the fighting proceeds.

President Harry S. Truman

The Air Service Group

LIEUTENANT COLONEL H. C. ZINDEL, *Air Corps*
Instructor, Command and Staff College

A change in the concept of organization and employment of Army Air Force Air Service Groups has come about through experiences in the various Theaters of Operations. The new type Air Service Group has been designed to provide third echelon supply and maintenance for a combat group operating from the same station on the basis of one Air Service Group per combat group.

The service organizations of the AAF, including the arms and services with the AAF (ASWAAF) were integrated as much as possible, thus eliminating small unit headquarters and simplifying both command and technical channels.

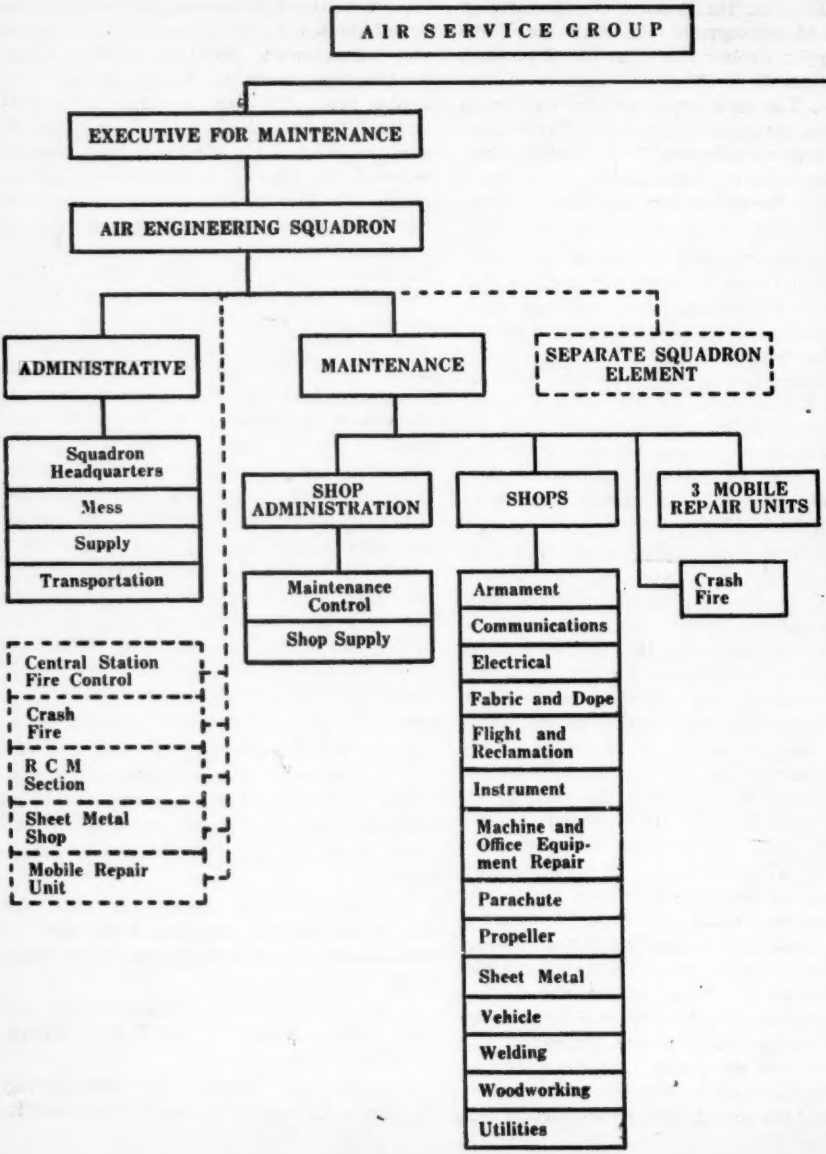
The integration of the Ordnance, Quartermaster, Signal, Engineer, Chemical, Finance, and Military Police personnel and equipment into the AAF Squadrons comprising the Air Service Group has made possible a reorganization of units along functional lines devoid of duplications of functions.

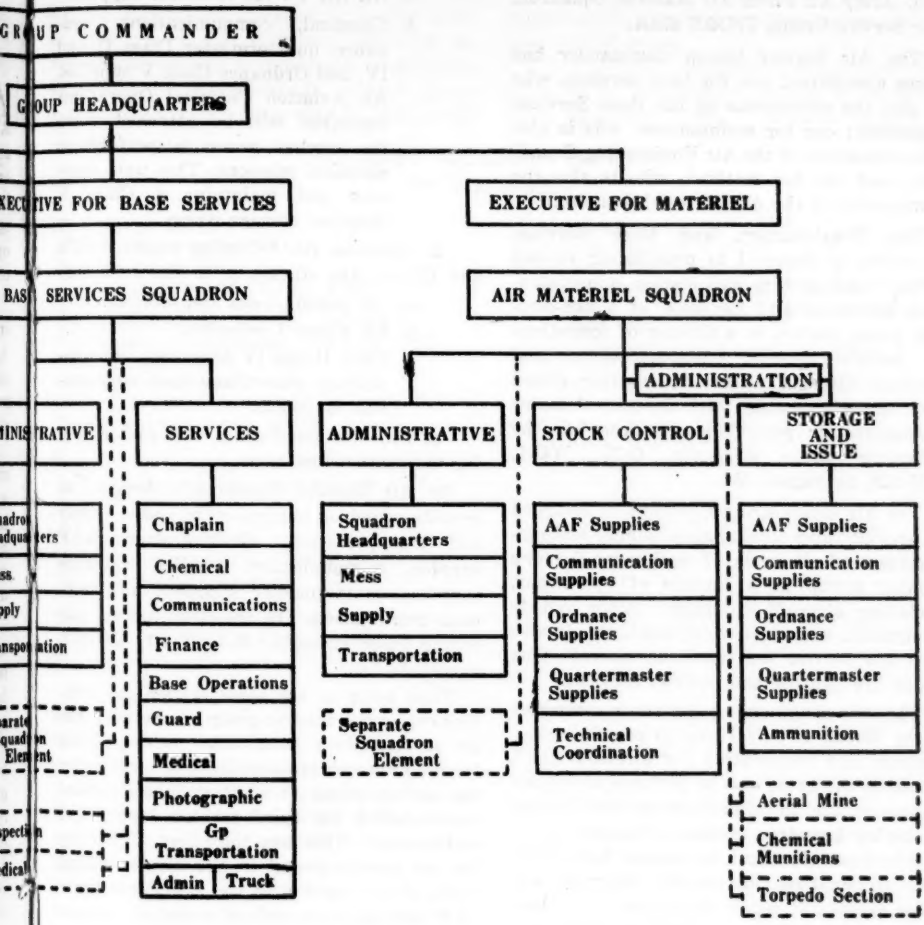
Paralleling the integration of ASWAAF units into the AAF, there has also been a move within the AAF to integrate the combat unit and service unit personnel and equipment. A brief résumé of this movement is as follows: AAF Regulation 65-1 states that one service center will maintain two combat groups operating from separate squadron airdromes away from the service center. In order to function properly, each organization (combat and service) was designed to be self-sufficient relative to internal administration and housekeeping. Consequently, there was much duplication of personnel and equipment in order to maintain each unit. The experience of the AAF in the theaters of operations has proved that rather than a squadron airdrome, groups occupied certain airdromes on air strips, locating the service group personnel at the airdrome right along with the combat unit it serves. Under this setup, the combat squadrons did not usually require the planned duplication of both personnel and equipment. Experience further dictated that the duplications referred to above be eliminated from the appropriate tables and, whenever the situation required it, the Air Service Group be integrated with the combat group. This was accomplished at first under T/O&Es 1-452 T, 1-457 T, and 1-458 T, and the basis for assignment was one integrated Air Service Group per one combat group. Air Service Groups organized under the "T" tables were successfully demonstrated in the European, Mediterranean, China-Burma-India, and the Pacific Theaters. Since the publication and use of the "T" tables, another set of tables was brought out. These were the "R" tables which were similar in many respects to the "T" tables, but were thought to be much stronger as many new ideas were incorporated. The main difference between the "T" and "R" type Air Service Groups is the integration of certain administrative, supply, and specialized maintenance personnel previously assigned to the combat unit into the Air Service Group "R" tables. The integration is then accomplished by adding "type" columns which correspond to the particular type combat group being supported to the "basic" Air Service Group "R" squadrons. The "basic" Air Service Group "R" is essentially the same as the "T" type in function, kind of personnel, and aggregate personnel. Only the combat crews, airplane and engine mechanics, and one armorer per airplane, together with a minimum number of administrative and supply personnel, have been retained in the "R" type combat squadron.

This article deals hereinafter with the Air Service Groups organized under the "R" tables. It is composed of the following squadrons:

1. Army Air Forces Headquarters and Base Service Squadron, Air Service Group, T/O&E 1-452R.

2. Army Air Forces Air Engineering Squadron, Air Service Group, T/O&E 1-457R.


AIR SERVICE GROUP
EXECUTIVE FOR MAINTENANCE
AIR ENGINEERING SQUADRON
ADMINISTRATIVE
MAINTENANCE
SEPARATE SQUADRON ELEMENT
Squadron Headquarters
Mess
Supply
Transportation
Central Station Fire Control
Crash Fire
R C M Section
Sheet Metal Shop
Mobile Repair Unit
SHOP ADMINISTRATION
Maintenance Control
Shop Supply
SHOPS
Armament
Communications
Electrical
Fabric and Dope
Flight and Reclamation
Instrument
Machine and Office Equipment Repair
Parachute
Propeller
Sheet Metal
Vehicle
Welding
Woodworking
Utilities
3 MOBILE REPAIR UNITS
Crash Fire



– – – – – Indicates sections furnished when authorized by War Department.

3. Army Air Force Air Matériel Squadron, Air Service Group, T/O&E 458R.

The Air Service Group Commander has three executives: one for base services, who is also the commander of the Base Services Squadron; one for maintenance, who is also the commander of the Air Engineering Squadron; and one for matériel, who is also the commander of the Air Matériel Squadron.

The Headquarters and Base Services Squadron is designed to provide air service group headquarters and station administration personnel and facilities at a one-combat group station in a theater of operations to include finance, communications, and medical dispensary service, interior guard and internal security, and the central motor transportation pool. This squadron has the following basic strength: O-27, WO-1, EM-228, aggregate 256.

The Air Engineering Squadron is designed to provide third echelon maintenance and reclamation of all items of equipment for one combat group in a theater of operations, including aircraft equipment, motor vehicle equipment, armament equipment, etc. It also provides service for transient aircraft plus crash fire fighting and utilities services.

The Air Engineering Squadron possesses three Mobile Repair Units to provide maintenance and reclamation for aircraft which crash in the area, and to perform air-repair functions. The shops provided by the Air Engineering Squadron include: armament, communications, electrical, fabric and dope, flight and reclamation, instrument, machine and office equipment repair, parachute, propeller, sheet metal, utilities, vehicle, welding, and woodworking. The shop administration is broken down into maintenance control and shop supply. The squadron has the following basic strength: O-13, WO-1, EM-262, aggregate 276.

The Air Matériel Squadron is designed to provide third echelon of supply as follows:

1. Receives, stores, and issues the following for one combat group on the same or dispersed airdromes:

a. All Air Forces technical supplies.

b. Chemical, communications, ordnance, quartermaster Class II and IV, and Ordnance Class V supplies. An Aviation Chemical Operations Squadron will be attached when the combat group is performing chemical missions. This unit operates and maintains a Class V chemical storage dump.

2. Operates the following required RPs and DPs at the station or in the area for:

a. All gasoline, oils and lubricants.

b. All Class I supplies.

c. Class II and IV Engineer items, including camouflage and construction materials.

3. Provides purchasing and contracting for the station and area.

The Air Matériel Squadron is designed to provide squadron headquarters, mess, supply and transportation, administration, AAF supplies, communication supplies, ordnance supplies, quartermaster supplies, and technical coordination. The squadron has the following basic strength: O-7, WO-1, EM-132, aggregate 140.

When units at the same station are commanded by the combat group commander, the air service group commander is responsible for the provision of essential base services for the combat group in addition to his normal responsibility for third echelon supply and maintenance. This has the effect of placing the air service group in the direct tactical chain of command with the Air Force Service Command in the role of technical advisor.

One interesting feature of this new Air Service Group is the guide for the separate squadron element. A separate squadron detachment may be composed of three separate elements appearing as columns in each Air Service Group table, and is capable of supporting a single combat squadron. Personnel in these combined elements, when augmented by officers and additional enlisted men as required for the particular situation, will provide second echelon and limited third

echelon supply, maintenance, and base services for one combat squadron operating independently beyond normal support distances or in assault operations. In assault operations, such a combination may be used as an advanced echelon. This separate squadron detachment is basically made up of 120 enlisted personnel—36 enlisted men from the Headquarters and Base Services Squadron, 28 enlisted men from the Air Matériel Squadron, and 56 enlisted men from the Air Engineering Squadron, and is augmented as indicated above.

SEPARATE SQUADRON ELEMENT
ENLISTED MEN

1 Armorer (511)
6 Airplane armorer (911)
4 Clerk-typist (405)
2 Cryptographic technician (805)
1 Message center clerk (667)
2 Radio operator (high speed) (766)
1 Telephone switchboard operator (650)
3 Guard patrolmen (522)
7 Military policemen (677)
2 Medical technician (409)
1 Surgical technician (861)
3 Cook (060)
13 Automotive equipment operator (345)
1 Motor transportation technician (014)
1 Messenger (345)
1 Clerk (055)
9 Supply clerk (835)
2 Weapons repairman (small-arms) (903)
1 Radar repairman (955)
2 Radio repairman (647)
2 Ammunition supply technician (505)
1 Fabric and dope mechanic (548)
4 Radio mechanic AAF (754)
4 Airplane and engine mechanic (747)
2 Airplane inspector (925)
1 Hydraulic mechanic (528)
1 Mobile repair unit chief (925)
1 Airplane and engine electrical accessories repairman (958)
2 Airplane instrument mechanic (686)
2 Machinist (114)
2 Airplane propeller mechanic (687)
8 Airplane sheet metal worker (585)
2 Aircraft welder (573)
1 Airplane woodworker (550)
4 Automotive repair (965)
1 AAF supply technician (826)
6 Warehouseman (590)
4 Munitions worker (901)
1 Cook's helper (590)
1 Mess sergeant (824)
1 Carpenter (050)
3 Electrical mechanic (685)
1 Construction machine operator (359)
1 Administrative specialist (502)
1 First sergeant (502)

Aggregate—120

Under proper authorization from the War Department, several additional sections can be added to each squadron when the necessity arises. In the Headquarters and Base Services Squadrons, these sections are as follows:

1. Medical Section, made up of 1 Dental Officer and 1 enlisted man, is used to supplement the normal medical service.

2. Inspection.

In the Air Matériel Squadron, the following sections can be added:

1. Aerial Mine Section may be included in ammunition section to store, process, and issue aerial mines.

2. Chemical Munitions Section may be included in ammunition section to receive, store, and issue Class V chemical supplies.

3. Torpedo Section, capable of maintaining 25 to 50 torpedoes.

In the Air Engineering Squadron, the following sections can be added:

1. Central Station Fire Control for third echelon maintenance (in the electrical shop) of aircraft remote control turret equipment.

2. Mobile Repair Units. One or more may be added or deleted as the situation demands.

3. RCM (radar countermeasures) Section for third echelon maintenance and repair on designated airborne radar equipment.

4. Sheet Metal Shop, for augmentation purposes.

5. Crash Fire service provided for each additional air base served.

The most important features in the new Air Service Group (R-type) is the outlining of a "basic" portion for each of the three

squadrons which make up the Air Service Group. This "basic" part of the squadron includes those individuals necessary to operate the squadron but to which additional personnel must be added in order to service properly a specific type of combat organization. Therefore, in each case, the number of personnel to service a combat unit is determined by utilizing the "basic" part of the Air Service Group and adding to it the number and kind of personnel required for the servicing of that particular type combat unit. The following table illustrates the increases in strength for each specific combat unit.

AIR SERVICE GROUP

	BASIC	WHEN SERVICING													
Squadron	Basic	Bomber (L)		Bomber (M)		Bomber (H)		Bomber (VH) with CFC (B-29)		Bomber (H) (B-32)		Fighter (1 or 2 engine)		Troop Carrier	
	Aggregate	Added	Aggregate	Added	Aggregate	Added	Aggregate	Added	Aggregate	Added	Aggregate	Added	Aggregate	Added	Aggregate
Headquarters & Base Service	256	37	293	37	293	37	293	37	293	37	293	65	321	37	293
Air Engineering	276	160	436	223	499	287	563	374	650	316	592	115	391	144	420
Air Matériel	140	72	212	136	276	140	280	183	323	183	323	49	189	23	163
Total Added		269		396		464		594		536		229		204	
Total Aggregate	672		941		1068		1136		1266		1208		901		876

Research and Development

If this nation is to remain a leader in the field of civil and military aviation, we must maintain a preeminent place in the field of aeronautical research and development. Today rapid and continuing developments in all phases of aeronautics make it imperative that we, as a nation, keep abreast of these developments and their practical application. Atomic energy, radar, winged missiles, pilotless aircraft, and jet propulsion all have an important application in the aeronautical field. Neglect of aeronautical research and development now could cause our country to fall behind in realizing the benefits from advances of the last decade.

Additional Report of the Special Committee investigating the National Program

Cargo Assembly

LIEUTENANT COLONEL J. D. HITTLE, *United States Marine Corps*

LOGISTICALLY speaking, each amphibious operation begins at the port of embarkation. From the standpoint of planning and execution, the logistics of an amphibious operation can be divided into four basic phases as follows: 1—the assembly of cargo; 2—the embarkation; 3—the debarkation; 4—the transition from a seaborne to a terrestrial supply system. If the recent war has proved anything, it is that each of these phases is dependent upon the previous phase for providing the necessary foundation for the successful development of the logistical plan. So interrelated are these four phases that an error in any single phase will be reflected and magnified in the succeeding phases.

The delicate progressive relationship of each step in the development of the logistical plan makes it manifestly clear why a carefully planned and efficiently supervised assembly of cargo is essential to later logistical success.

Necessity for Planning and Supervision

Indeed, the manner in which the assembly of cargo is accomplished can well be accepted as an accurate criterion of the overall efficiency with which the logistics of the operation is being planned and will be executed. Although the actual assembly of cargo required for mounting out may begin a month prior to the start of loading, and perhaps as much as two months before D-day, the execution of the logistical plan begins when the first item of matériel arrives in its cargo assembly area in the vicinity of the docks or beach from which it will be loaded.

A brief examination of the matériel required in the initial loading of a "typical" assault division should serve to demonstrate the immensity of the logistical problem confronting the planners for an amphibious operation. Just as an example, one of the three Marine Divisions of the V Amphibious Corps destined for Iwo Jima loaded over 9,500 tons of bulk cargo and 6,000 tons of vehicles in the initial lift. Every type of supply or equipment necessary to sustain a division through a minimum period of about thirty days helped make up this total tonnage. Exact amounts of each type of supply: rations, fuel, ammunition, camp equipment, baggage, etc., had to be loaded on each of the transports and landing ships embarking the reinforced division. Over 15,000 tons of matériel of war divided into exact amounts were delivered and loaded on twenty transports and numerous landing ships.

Events Prior to Formulating Cargo Assembly Plans

But, even before the first truck rolls into the cargo assembly area with its load, the bulk of all the logistical plans for that operation must be in at least a tentatively completed form. A certain sequence of events will take place before the cargo assembly plan can be formulated by the G-4 section of a division general staff.

First, the basic decisions must be received from higher authority which in most cases will be Corps. This information, usually conveyed in a tentative administrative plan and supplemented by memoranda and letters of instruction, will contain data on the assignment of ships, and the amounts of each type of supplies to be embarked. Normally, ammunition is referred to in units of fire and the other types of supplies are in "days of supply." Upon receipt of this directive, the G-4 section and the affiliated special staff sections determine the exact amounts of each type of material required to conform to the corps order. Before it is possible to allocate definite amounts of supplies to each ship, it is necessary to know how many troops are to be assigned to each ship. Ship assignment of personnel cannot be made until the task organization within the division is determined.

G-3 prepares the recommended task organization of the Regimental Combat Teams and separate organizations, and upon approval by the Chief of Staff and the Commanding General the assignment of shipping can begin. The loading of the ships in an amphibious operation is a function of the G-4

section of the staff. However, like so many other staff functions in amphibious planning that require close staff coordination, ship assignments should be planned by G-4 in conference with the Transport Quartermaster and G-3. The Division Transport Quartermaster prepares the actual embarkation plans as directed by G-4. Almost invariably during the assignment of shipping it is necessary to make minor modifications in troop organization in order to make the troop organizations fit the ships. Because G-3 is vitally concerned with the composition of his task organization, he should participate in the initial conferences on shipping assignments, and he should be immediately notified whenever additional modifications in troop organization are anticipated.

Shipping Assignment Procedure

On the division level two different shipping assignment procedures may be followed. Some divisions have adhered to the policy of making all shipping assignments of all troops within the division task organization, stipulating what troops will go on each individual ship. This method largely eliminates the RCT as a factor in this phase of the embarkation planning, and it is contended by those who use this system that it allows a closer control of shipping assignment and permits maximum utilization of all cargo space, due to the fact that the space not used by RCT and BLT cargo can be readily allocated to division matériel.

The other system of shipping assignment follows the procedure in which the Division assigns one or more ships to RCT's and separate task organizations, and permits these RCT and separate organization commanders to make the detailed assignment of organizations and cargo in the manner that they judge will best fit the tactical and logistical plans of their units. Following this method, if a transport division of four APA's and one AKA should be assigned to a RCT, the RCT commander would issue an order indicating which BLT's and which additional troops would go on each of the ships assigned to that particular RCT.

Both of these systems have been successfully employed by different divisions at different times in the Pacific Theater. The first method allows maximum control by division. The second permits the RCT's to function more completely as a logistical, as well as a tactical planning and executing agency, and it appears to adhere a bit closer to the too often forgotten command principles of telling subordinate units "WHAT to do but not HOW to do it."

Control of Divisional Embarkations

The technique of controlling divisional embarkations has undergone considerable evolution during the course of the recent war. In some of the earlier operations the embarkations were directed by use of the same administrative order that was to be used for the actual landing. Often the larger part of the embarkation was directed by a combination of verbal orders, the inclusion of a mass of embarkation data in the basic administrative order for the landing, and in some cases much supply data wandered over into the operational embarkation order drawn for the primary purpose of controlling the movement of personnel to the ships.

Gradually, it becomes apparent that, while the embarkation and the debarkation of an amphibious division were interrelated phases of the entire logistical plan, each was a major endeavor from the standpoint of planning and execution, and as such, each required a separate order. Thus, there would be one order controlling the entire logistical embarkation with all the mass of detail, much of which data, such as traffic control in the harbor area and protection of assembled cargo, certainly had no reason for being included in an order covering the directions for the landing proper.

As the final amphibious operations of the war were being planned, this order designed to direct the supply embarkation became generally known by one of two names, depending on the organization issuing the order. In some instances it was called the "Administrative Warning Order," and it was some-

times titled the "Administrative Embarkation Order." Technically, such an order could not be properly termed a warning order in the stricter sense, since it provided for the *execution* of the directives contained in the order. However, it is a minor point. The contents of an order rather than the title are the important features. As far as the contents are concerned, there are no important variations between the "Administrative Warning Order" and the "Administrative Embarkation Order."

Administrative Embarkation Order

A brief analysis of the form and contents of the "Administrative Embarkation Order" issued by one of the Marine Divisions participating in the Iwo Jima Operation will serve to illustrate the nature of such a documentary instrument. This particular order was divided into five paragraphs as follows:

Paragraph 1, "General," gave such general information as was available at the time, stating that the division was to embark, reinforced, for the Iwo Jima operation (designated by the code name), that ships would be combat unit loaded, and that the date of embarkation would be announced.

Paragraph 2, "Allocation of Shipping," referred subordinate organizations to the "Embarkation Plan" in which shipping was assigned to RCT's and separate task organizations, and it stipulated the time by which the respective subordinate commanders would submit for approval their plans for allocation of ships to the subordinate units within their organizations. In addition, it contained the information, also found in the division embarkation SOP, but reiterated in the order for emphasis, that the Division Transport Quartermaster Section would assist subordinate commanders in the preparation of embarkation plans.

Paragraph 3, "Uniform and Equipment," prescribed the uniform and individual equipment for embarkation, as well as the allowance of sea bags with their contents for enlisted personnel, and the limitation on personal baggage for officers. The information relating to embarkation uniform and equipment serves to illustrate the need for a separate order on such matters for embarkation for, since the weather at the port of embarkation will not always be the same as that at the target, different uniforms for the embarkation and the debarkation are often necessary.

Paragraph 4, "Supply," contained all the necessary information regarding the loading of all supply items. It stated the amount of each class of supply, itemized as necessary, to be embarked. Special information regarding the percentage of each item to be palletized was furnished, as are any other special directives pertaining to items to be loaded in amphibious cargo trailers or those units which were to receive any other type of special preparation.

For purposes of convenience, quantities to be loaded were listed by Class of Supply, and followed the sequence in which the items in each class are listed in the Marine Corps Tables of Allowances so as to facilitate ready reference to that item in those tables.

The detail to which such instructions go regarding the amount of items to be loaded will vary with the type of operation, the experience of the division, and the amount of shipping space available. In a division that has accumulated logistical experience in several operations and learned the use of existing Standing Operating Procedures less detail is required. Often, when adequate shipping space is available the only items stipulated under a separate paragraph will be the amounts of rations, gasoline and ammunition to be loaded, and the particular items of Classes II and IV that it is considered necessary to embark. The remainder of the equipment in Classes II and IV in such cases is left to the discretion of the RCT commander, who should at all times be given as much discretion as proper divisional control will permit.

Paragraph 5, "Miscellaneous," contained specific information regarding preparations for loading of ships, control of traffic, establishment of the Transport Quartermaster

Command Post, responsibilities of the various unit commanders and special staff officers for the delivery of the different items of supply and equipment to the cargo assembly areas, and the directions relative to the necessary reports by embarking units.

The annexes to the "Administrative Embarkation Order" were more voluminous than is the body of the order itself. The exact number and type of annexes to this order will vary according to the shipping and the type of operation. Usually the following annexes will be promulgated: The "Embarkation Plan" presents in chart form the complete assignment of personnel and cargo to the transport divisions and landing ships. The troop and cargo requirements of each subordinate command are shown on the chart in terms of officer and enlisted strength and cube, square, and weight of supplies and equipment to be loaded. Since the personnel, cube, square, and weight capacities of the assigned shipping are also shown on the same chart for each transport division and assigned landing ships, the "required" and "available" shipping figures are readily referred to.

The Embarkation Plan

It must be realized that the initial "Embarkation Plan" chart is much like a trial balance in bookkeeping. When the tentative embarkation plan is first prepared, there are still many logistical details remaining to "firm up." Yet the essential information is available as the basic decisions have been made as to the amount of matériel to be lifted, and the shipping capacities are based upon the individual ship characteristics of the assigned vessels. It would be expecting a Transport Quartermaster's Utopia to believe that no changes would be made in assigned ships between the time the initial embarkation plan is made and the completion of loading. Shipping changes, unfortunately, are inevitable, but once an embarkation plan is prepared, subsequent plans can be issued, adjusted on the shipping changes. It is easier to change an existing plan than it is to start from nothing and make a new one.

Upon receipt of the division embarkation plan, the designated subordinate commanders—usually termed "Embarkation Group Commanders"—prepare a similar chart showing the assignment of individual units of their command to the individual ships. The embarkation plan, an annex to the administrative embarkation order, is authenticated by the G-4 or S-4, depending on the issuing echelons. Numerous minor changes will normally be made in the chart after the detailed individual ship loading plans are formulated. This is due to the fact that, particularly with vehicles, it is not possible to determine exactly how many vehicles can be loaded on the shipping until the individual and ship loading plans are completed. However, experience has indicated that a fairly accurate estimate of the usable square footage for vehicles can be made by utilizing a twenty-five per cent broken stowage factor for vehicle space when preparing the embarkation plan.

Vehicles and Fuel Consuming Equipment to be Lifted

Another problem requiring detailed planning is the question of what fuel consuming equipment will be lifted. Normally, the directive from corps will specify merely the percentages of light and heavy vehicles to be loaded, and will sometimes stipulate that certain engineering equipment will be embarked. As a consequence, it remains for the division to prepare the detailed data as to what vehicles and fuel consuming equipment will be carried. This information is issued in the form of an annex to the administrative embarkation order and has been referred to as the "Vehicles and Fuel Consuming Equipment to be Lifted." Naturally, the decision as to how many items of such equipment to be loaded cannot be made until the G-4 has the information as to how much suitable square footage will be available in the assigned shipping for vehicle stowage. After receiving the square footage data the chart is filled out showing the number of

each type of fuel consuming equipment to be lifted by each unit of the division. Such a form serves two purposes. First, it permits the accurate control of amount of such equipment being lifted, and how much remains in the rear echelon for possible turn-around shipping. Second, it provides an accurate basis for computing the Class III (fuel and lubricants) requirements.

In order to control accurately the amounts of Class I (rations), Class III (fuel and lubricants) and Class V (ammunition) the G-4 section, assisted by the appropriate special staff officers, prepares separate annexes indicating the exact amount of each item of each class of supplies to be loaded on each ship. While it is possible for the subordinate units to compute their own data in this matter, it will usually assure greater accuracy, uniformity of computation procedure, and easier recapitulation of total amounts required for the division, when such annexes are prepared under Division G-4 direction. Also, it relieves the not-overstaffed subordinate echelons from a laborious and time consuming job. Such annexes usually go by the names "Fuel Breakdown," or "Fuel Loading Analysis"; or "Ammunition Breakdown," "Ammunition Loading Analysis"; etc.

Tentative Administrative Embarkation Orders with as many annexes as possible should be distributed at the earliest practicable time. As logistic plans become firmer, changes or additional tentative drafts may be promulgated. Then, when it is "reasonably certain" that the logistic plans are in definite form, final draft can be promulgated. RCT's will usually find it advantageous to prepare their own Administrative Embarkation Orders based upon the Division Order.

Timely and carefully prepared Administrative Embarkation Orders (or their equivalent—whatever the name) are indispensable to a smooth and efficient embarkation.

Methods of Assembling Cargo

Generally speaking, there are two basic methods of assembling cargo in a harbor area. The first is termed "Type Assembly" of cargo. This system provides for assembling principal types of supply, such as rations, ammunition, and fuel, in central dumps in the harbor area. When each BLT or other embarkation unit commences loading it draws the amount required by that organization. The second method is called "Unit Assembly." By this system each ship has a designated area provided in the vicinity of the harbor, and the exact amount of each type of cargo to be loaded on that ship is assembled and temporarily stored in the proper ship assembly area. Trucks delivering supplies from central dumps in the base camp or supply depot take their cargo to a designated ship assembly area. Consequently, before any ship begins loading, the cargo destined for that ship has been collected, inventoried, and made ready to be dispatched to the appropriate ship. When loading of a ship begins, direct routing of the assigned trucks from the ship assembly area to the proper dock is possible. This definitely facilitates control of the movement of supplies and the control of trucks, both of which are very real problems in any embarkation.

"Pile Tags"

Contrary to some previously voiced opinions on the subject, the use of "pile tags" will work and add to the efficiency of any embarkation. All the "pile tag" amounts to is a slip of paper filled out, usually a mimeographed form, having spaces for entering such information as: type of cargo, amount of cargo by number of items and weight, ship assembly area to which dispatched, time of dispatching, time of receipt, and signature of dispatcher. Such additional information as is required by special circumstances may be included in the form. These tags are used much in the manner of any shipping ticket. For instance: a truck drives into a depot ammunition dump from which ammunition is being sent to the harbor area. The representative of the Division Ordance Officer will normally be directing the loading and dispatching of trucks hauling ammunition. He will have the previously prepared "Ammunition Loading Analysis" showing the exact amount of each type of ammunition going to

each ship. On the basis of this annex, plus his running account of how much ammunition by type he has already dispatched, he directs that the truck be loaded with a certain amount of ammunition. He then fills out the pile tag in triplicate, keeps one copy for his own records, and gives two copies to the truck driver. The truck driver delivers one copy when he checks in at the Division Transport Quartermaster Command Post and turns in the final copy to the BLT Transport Quartermaster when the truck delivers the load to the proper ship assembly area. Thus, by use of the pile tag, accurate running records are kept at the dispatching dump, the Transport Quartermaster Command Post, and the individual ship assembly area. The pile tag also serves as a quick "check-off" or inventory list for the receiving Transport Quartermaster.

The TQM CP

The TQM CP is the command post established by the Division Transport Quartermaster in the harbor vicinity. In practice it functions as a regulating and control point for the movement of supplies and equipment to the ship cargo assembly areas. All trucks loaded with supplies for the assembly areas are required to stop at the TQM CP where one copy of the pile tag is picked up, and the driver is furnished with necessary information as to the location of the ship assembly to which the cargo is to be delivered. Within the TQM CP clerical personnel maintain a large board on which are attached separate envelopes for all ships for which cargo is being assembled. As each pile tag comes into the CP, it is dropped into the envelope carrying the name of the ship assembly area for which the cargo is headed. It is therefore possible, on the basis of an hourly totaling of pile tags in each envelope to determine the exact amount of each type of cargo assembled by individual ship and the status of progress of the cargo assembly operation.

Also, the TQM CP functions as the headquarters for the entire cargo assembly process. In addition to the Division TQM there is usually a representative of the G-4 section at the CP at all times. The CP has telephone or radio communication to all dumps and assembly areas. In order to eliminate the danger of bottlenecks resulting from too many trucks being dispatched to the same assembly areas faster than the vehicles can be unloaded, the TQM CP receives frequent reports from Division TQM officers supervising each group of several individual ship assembly areas. When there is a threat of congestion in any area, the report reaches the TQM CP, from which point radio or telephonic instructions are immediately sent to the dumps directing that no more vehicles be sent to the congested area and more be dispatched to designated clear areas.

Experiences in Iwo Jima

Certain experience figures gained in mounting one of the Marine Divisions for Iwo Jima will serve to illustrate the size of the problem involved in the movement of matériel to the cargo assembly areas. In this particular instance the division was located in one of the advance bases in the Marianas. The base camp was approximately fifteen miles from the cargo assembly areas, and supplies were drawn from five different dumps located as far as ten to twelve miles from the harbor. Roads were under construction in numerous places, necessitating detours. Under these circumstances it required fifteen days to assemble all division cargo in ship assembly areas. For the first five days 150 trucks were used, the total being gradually reduced to seventy-five as the time for commencement or loading drew near. Because it is not economical to assemble cargo during night hours, the assembly of cargo was restricted to daytime.

In order to facilitate control of so many trucks the Division Motor Transport Officer, supervising all trucking, and working in close coordination with the Division TQM, maintained a constant road patrol to prevent drivers from becoming lost in the numerous roads leading into the harbor area. To permit ready recognition of trucks, all vehicles carrying division cargo were iden-

tified with a large white chalk insignia on the front, rear and sides of the body. In order to effect further coordination of traffic, the Motor Transport Officer, maintaining an emergency motor pool in the vicinity of the TQM CP, possessed radio communications with his road patrol and with his officer-supervisor working with the Division TQM representative in each area.

After completion of the cargo assembly, a two or three day period should be allowed for inventorying all items in each ship assembly area, and ascertaining that the amounts check with the totals prescribed for each ship as shown in the annexes to the administrative embarkation order. During these two or three days, such necessary adjustments may be made as are necessary to put the correct amount of each type of matériel in each ship assembly area. The TQM CP is notified when this is accomplished for each ship.

Close coordination between all officers in charge of dispatching from dumps, officers in charge of ship assembly areas, supervisory TQM's and motor transport officers throughout the harbor area, the Division Motor Transport Officer and the Division TQM, all working under the general supervision of G-4 is imperative. Difficulties can best be eliminated by anticipating and taking immediate remedial action as soon as such troubles begin to develop.

Assembly of cargo requires as much—if not more—planning and careful supervision of execution as do any of the subsequent logistical phases of an amphibious operation.

Contrary to the impressions occasionally conveyed by some news stories, the preparations for loading an amphibious division are not quite so simple as the planning required to get aboard the Staten Island Ferry.

Even with our overwhelming concentrations of air power and fire power, this war has been the most costly of any in which the Nation has engaged. The victory in Europe alone cost us 772,626 battle casualties of which 160,045 are dead. The price of victory in the Pacific was 170,596 including 41,332 dead. Army battle deaths since 7 December 1941 were greater than the combined losses, Union and Confederate, of the Civil War. I present the following comparisons of the battle deaths we have suffered in all our wars so that there can be no misunderstanding of the enormous cost of this conflict, for which we were so completely unprepared:

	Number of months duration	*Total battle deaths*	*Average battle deaths per month*
American Revolution	80	4,044	50
War of 1812	30	1,877	62
Mexican War	20	1,721	86
Civil War (Union Losses)	48	110,700	2,293
Civil War (Confederate Losses)	48	74,524	1,552
Spanish-American	4	345	86
World War I	19	50,510	2,658
World War II	44	201,367	4,576

Army casualties in all theaters from 7 December 1941 until the end of the period of this report total 943,222, including 201,367 killed, 570,783 wounded, 114,205 prisoners, 56,867 missing; of the total wounded, prisoners, or missing more than 633,200 have returned to duty, or have been evacuated to the United States.

General of the Army George C. Marshall

Destruction of Electrical Power Systems in Southern Germany

LIEUTENANT COLONEL JACK N. NAHAS, *Signal Corps*
Instructor, Command and Staff College

IT is generally accepted that modern industry is dependent to a large extent on electric power. This is more true in Germany where industry consumed ninety-three per cent of all electric power generated or imported into the country.

When allied troops entered Germany, they expected to see an enormous amount of damage. They were not disappointed. However, to the observer with technical background there seemed to be a discrepancy between the expected amount of damage to German industry and the multitude of factories, power stations, substations, and power lines which were intact.

It must be assumed that if power plants were not subjected to air attacks, those who selected the targets had ample reason for sparing them. It is believed, however, that the destruction of the electric power industry in Germany would have contributed materially to the disruption of German industry and that plans for bombing of enemy targets would not overlook the extremely important targets presented by the electric power industry.

Popular accounts of the bombing of Germany indicated that German industry was being pulverized by constant and repeated attacks; vital industries were being wiped out as fast as planes could carry their lethal loads; factories which produced ballbearings and other bottleneck items were targets of special interest. German industry must surely collapse because of the sheer weight of explosives which were being pinpointed into those places where they would do the most damage.

Upon entering southern Germany, it was found that indeed an enormous amount of damage had been done. The damage to cities in many cases varied from nothing to almost complete destruction. To the casual observer, the plan of bombing German industry seemed indeed to have brought almost irreparable damage. The casual observer might remark that it was no wonder that Germany finally collapsed. He might marvel at how the German people had held out so long with their industry apparently completely obliterated. However, an inspection of the factories and industry in southern Germany would lead one in most cases to an entirely different conclusion. If the inspector were critical, he might reasonably ask, just what was destroyed—what effect did it have on the war effort—were industries deliberately overlooked and not bombed? Why would the conclusions which one would draw from having read the popular accounts published in newspapers and periodicals be so different from the conclusions drawn from the inspection of conditions as they existed on the ground? Practically every village and hamlet in southern Germany had at least one factory. Invariably this factory had a smokestack which stood out like a sore thumb on the landscape and almost invariably, the factory and smokestack were intact. Almost without exception, power lines led in to every factory, and equally without exception, the factory had lights and power available even after occupation. It could perhaps be argued easily that because of the multitude of these factories, destruction of each individual plant was impractical and that a wholesale bombing of the key industries would achieve the desired result. Assuming this to be the case, there seems still to be a discrepancy between the popular accounts of destruction of German industry and the facts as they existed, when it is considered that a machine which has been stopped because of lack of power is normally as useless as one which has been damaged.

The electric utility industry in Germany is owned and operated by a multitude of companies, all working under the equivalent

of a national public utility commission. With very few exceptions, the major companies are all tied into an electrical grid system which makes interchange of power between all sections of the country possible. Power is derived in northern and western Germany from thermal stations. Thermal stations are generally of two types—the soft or brown coal stations, using low-grade fuels. These stations are usually located at the pit mouth and the electrical output fed into the power grid on the principle that it is cheaper to transport the electricity than the low-grade fuels. Other generating stations burning hard coal are strategically located, usually near large load centers, it being in these cases more economical to transport the fuel than to transmit the power. In central and southern Germany, along the Swiss border, along the Austrian border, and in Austria, there are many hydroelectric stations. These stations usually deliver full capacity in the warm months and are capable of carrying reduced loads in the winter months when their sources of water have frozen. The whole is integrated into what is effectively a national power system. As previously stated, about ninety-three per cent of the total amount of power generated and imported into Germany is used for industrial purposes. All other purposes collectively use approximately seven per cent of the capacity. The generating stations with their substations, switching points and associated equipment can be said to form the vital organs of the body of German industry. The transmission lines are the veins carrying the life blood of the industry of the country. The high frequency telephone circuits imposed on the power transmission lines and the commercial communication circuits used to control this vast electrical grid system is in fact the counterpart of the nervous system of a body.

Popular accounts of the bombing of Germany and spectacular raids on dams had led to a belief among some allied utilities officers that German utilities would have been destroyed to an appreciable measure. Inspection of generating stations and associated equipment and transmission lines of southern Germany and Austria showed that this was not the case. An incomplete survey of southern Germany did not bring to light a single German power station which had been destroyed. It uncovered only four instances of raids on power stations and associated equipment, and in two of these instances, the raids seemed to have been incidental to other operations. No account of damage by aerial action to any part of the thousands of miles of transmission lines was uncovered. In fact it became common practice in some localities for German civilians to congregate at generating stations during an air raid because this seemed to be the safest place in the area.

The officials of German power companies in many cases expressed surprise at the fact that the generating stations and transmission lines seemed to have been left alone deliberately in the bombing raids. More than one of them expressed the opinion that had German power stations been bombed, the paralyzing effect on Germany would have been such that the war might have been ended six months sooner. They indicated that in many cases, when a factory was bombed a new factory was built underground and this factory continued in operation, immune from aerial bombardment. The life blood of the factory continued to flow to it through the miles of transmission lines placed where all who were interested might see them.

The Germans asked the question over and over again, "Why were not power plants bombed?" They told of the incident whereby four fighter planes approached a station in the Black Forest. Two of the fighter planes descended on the station while the remaining two formed an aerial cover. In one strafing pass at the station, these two fighter planes punctured the transformer tanks, releasing several thousands of liters of transformer oil which took months to replace, but the station, by the use of emergency equipment, was back in operation within twelve hours. Had a similar attack been made the following day, the station would have been out of service for several weeks. They told

of another incident whereby a station situated near a river was damaged by aerial bombardment when bombers attacked a barge in the river. The generating station itself was not hit but the concussion caused by the bombs coupled with the inertia of the rotor of a 40,000 kilowatt alternator, which was operating under full load, caused the machine to jump enough to make contact between the rotor blades and the case of the turbine. As a result, the machine was out of operation for approximately a month. This same station was on another occasion subjected to an attack in which it appears that one bomb was dropped between two of the buildings but did no appreciable damage. The fourth incident was that of a bombing raid by a single plane on the dam of a pumped storage hydro-electric station resulting in insignificant damage to the dam. Even had the dam been completely destroyed, the station could have continued operating at part load. The loss to the total German grid system would have been negligible.

The observations expressed in this article are based on inspection of many electrical installations in southern Germany. The only damage worthy of note which was seen or mentioned by the German officials was caused by ground-fighting in the vicinity of transmission lines. Contact with many officials of German power companies did not reveal that there was any worthwhile damage to any generating stations or associated equipment. The conclusions drawn from observations and contacts seemed to indicate that the electrical system which normally would seem to be an extremely vulnerable and relatively easy target was deliberately left untouched.

Intelligence data available long before the allied armies entered German soil listed almost all major generating installations and transmission lines. Yet questioning of many pilots after VE-day failed to reveal a single one who had ever received the mission of attacking a power plant or a transmission line, or who had first hand information of such a mission being assigned.

Electrical generating and transmission equipment because of its nature is extremely vulnerable. The equipment is difficult to design and build. It requires large amounts of critical material and skilled labor. Repair of the equipment is difficult and time-consuming. Damaged parts must often be moved long distances to repair facilities. Replacement of individual generators under the best conditions would take several months. Wholesale replacement of several large numbers of generators and high voltage transformers would have been almost a physical impossibility. Power plants and transmission lines present targets which are comparable in size to marshaling yards and railroad tracks. Once a station is destroyed, the probabilities of ever replacing it under wartime conditions is extremely limited. The lines in fact are used to distribute the energy equivalent of thousands of cars of coal daily throughout the country. Transmission lines can be attacked at random. A break in any part of the line renders the entire line, and the generating equipment attached to it, useless until repairs are made and, what is of more importance, all industry dependent on the line for power must also come to a standstill until the break has been repaired. Since almost all of the electric power consumed in Germany was used for industrial purposes, the constant interruption of power and methodical destruction of generating equipment would have a paralyzing effect on German industry. Any attack on industry which fails to make the electric power system a primary target fails to take advantage of an item without which no industrial nation can exist.

MILITARY NOTES AROUND THE WORLD

GERMANY

"Lightning Bolt":

The Army's answer to the need for a mobile, striking force in Germany is now formed under the Headquarters of the United States Constabulary.

To develop into the most mobile outfit in the US Army, the Constabulary employs light tanks, armored cars and jeeps, motorcycles, horses and liaison-type aircraft.

The nucleus of the new command is based around famous combat units such as Headquarters VI Corps, elements of the 1st and 4th Armored Divisions, the 2d, 4th, 6th, 11th, 14th Cavalry Groups plus Tank Destroyer and Antiaircraft Artillery organizations.

The "Lightning Bolt"—as the Constabulary is known throughout the Zone—is a highly trained organization. Because the unit's task is the most delicate and difficult any command has had since the war's end, troopers are trained in a way that surpasses any previous military conditioning program. The nature of assignments makes it necessary that each trooper function both individually and in a team in the dual role of soldier and special policeman.

The specialized outfit tackles the problem of border patrolling, "search and seizure" operations, and zonal security patrols. Augmenting local agencies and the military police, it works hand-in-hand with Counter Intelligence Corps, Criminal Investigation Division, and the German civil police.

Except for medics and bandsmen, every man who wears the Constabulary shoulder patch—a bright circular design of a blue "C" pierced by a lightning streak on a golden background—is armed with a pistol as well as heavier weapons.

(Weekly Information Bulletin)

Bombing Attacks on Germany:

A survey of strategic bombing states that the RAF lost 79,281 airmen killed and the US AAF 79,265 in the allied bombing attacks on Germany.

When the allied air offensive on the western front was at its peak 28,000 operational airplanes, manned and serviced by 1,300,000 men, were in use.

The RAF lost 22,000 aircraft and the US AAF 18,000 aircraft in the attacks, the report states. The survey found that the raid on a German city which battered Germany most was that by the RAF on Hamburg in August, 1943, when the Germans estimated 60,000 to 100,000 persons were killed and about one-third of the houses were destroyed.

The report, which was drawn up by a group of American civilians states:—"Experience shows that whatever the target system used, no indispensable industry was permanently put out of commission by a single attack. Persistent re-attack was necessary."

The investigators, refer to one major point in tactics—"incendiary bombs, ton for ton, were found to have been four or five times as destructive as high explosive bombs."

The figure of 79,281 RAF airmen lost, given in the report, is the total killed up to May, 1945 of Bomber Command only in northwest Europe. It therefore excludes 2d Tactical Air Force, Fighter Command, and Coastal Command.

(From a news report)

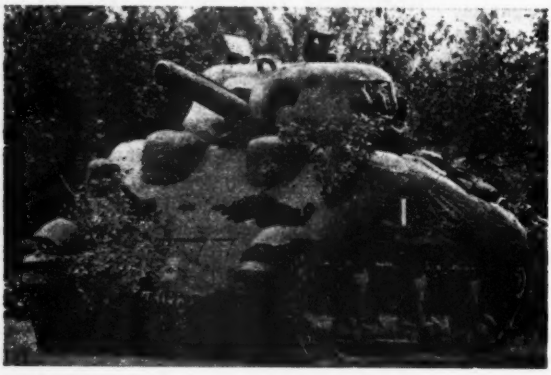
GREAT BRITAIN

More About Decoys:

The War Office has released more details about the most modern use of camouflage in war, and the use of decoys such as guns, vehicles, and landing craft to draw enemy fire. In addition to lack of fidelity, the main

faults in the early types were their weight and bulk, the time taken to erect them, and the constant maintenance required particularly during the sandstorm season in the Middle East. By 1942 these difficulties had been largely overcome by the improvisation of barrage balloon material for the manufacture of pneumatic devices. A Sherman device could be packed into a hold-all little larger than a cricket bag, and inflated to the size of a real Sherman tank; yet it weighed only 170 pounds, against the Sherman's thirty-five tons, and took only five minutes to inflate and erect.

(The Times Weekly Edition)



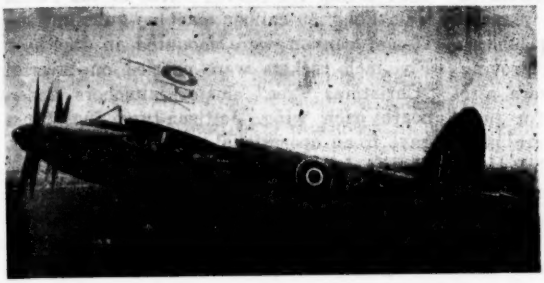
Naval Twin-Engine Aircraft:

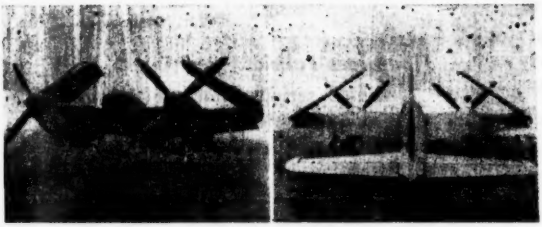
The Admiralty has recently announced the development of twin-engined aircraft capable of operating from the narrow confines of a fleet or light fleet-carrier as part of the general plan to arm the naval squadrons with the finest aircraft made in Britain and able to hold their own against the best shore-based interceptors.

The aircraft chosen are the De Havilland Sea Hornet MK 20 and the De Havilland Sea Mosquito MK 33, which are both adaptations of famous RAF aircraft with certain changes in design.

The naval version of the Mosquito is a two-seater torpedo-carrying strike aircraft powered by two Rolls Royce Merlin 25 engines of 1,640 horsepower driving special four-bladed airscrews. The wings are made to fold by hand and there is provision for a rocket-assisted take-off gear (RATOG) and arrested landings. The armament is four 20-mm guns in the nose and the torpedo or heavy bomb is carried centrally under the fuselage. On the wings either eight sixty-pound rocket projectiles can be mounted or else two 100-gallon drop tanks which give an effective range of 1,260 miles. The maximum speed of the Sea Mosquito is 376 miles per hour and it can reach 20,000 feet in nine minutes.

The naval Hornet is a single-seater long-range strike-fighter which resembles the Mosquito in appearance except that it is much smaller and the lines are finer. The wings fold under power from a control in





the cockpit and there is provision on them for either six sixty-pound rockets projectiles or two 100-gallon drop tanks which give a maximum range of 1,960 miles. The armament is the standard four 20-mm guns in the nose and the aircraft can take two 1,000 pound bombs or one 2,000 pound bomb hung under the fuselage. The maximum speed of the aircraft is 460 miles per hour and it can reach 20,000 feet in 4.7 minutes.

(*The Fleet*, Great Britain)

Radar for the Mail Run:

RAF Transport Command mail and newspaper runs in Germany and northwestern Europe have been greatly improved by the use of radar aids which were successfully employed in airborne operations during the war. Often operating in the worst possible weather conditions, the aircraft were enabled to drop their newspapers blind when fog or bad visibility obscured the airfield, thus speeding up the schedule for the round trip from England to Germany, and insuring delivery of the papers at the earliest possible moment.

(*The Aeroplane*, Great Britain)

The "Haslar":

Smoke played an important part in the defense of British towns during the repeated attacks by the Luftwaffe in the Battle of Britain. One of the widely used smoke-laying units, the "Haslar," is pictured below.

Fleets of the "Haslar" were held in reserve, ready to be rushed to threatened towns as soon as radio-location had devined the intentions of approaching bombers. The target was then quickly covered by an effective smoke screen.

(*The Illustrated London News*, Great Britain)

JAPAN

Biological Warfare:

Intelligence Reports show that Japan had made definite progress in biological warfare. It is known that the Japanese Army fostered offensive developments in this field from 1936 until as late as 1945.

Intensive efforts were expanded by Japanese military men toward forging biological

agents into practical weapons of offensive warfare. Modifications of various weapons developed through research in their laboratories were field-tested at Army proving grounds where field experiments were also conducted in the use of bacteria for purposes of sabotage. These efforts were pursued with energy and ingenuity. While definite progress was made, the Japanese had not at the time the war ended reached a position whereby these offensive projects could have been placed in operational use.

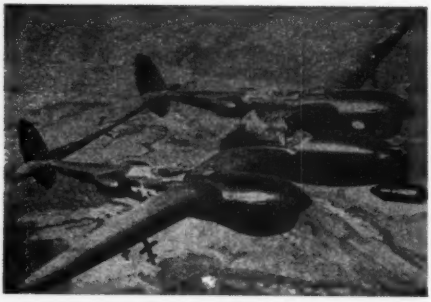
There is no evidence that the enemy ever resorted to this means of warfare. Whether the Japanese Army could have perfected these weapons in time and would have eventually used them had the war continued is of course not known.

(From a news report)

UNITED STATES

Faster Night Fighter:

Lockheed's Night Lightning, a radar-equipped modification of the P-38, had a 425 miles per hour speed which made it about fifty miles per hour faster than earlier night fighters. The radar operator's cockpit,



slightly raised behind the pilot's, and detection equipment housed in a streamlined carrier resembling a small auxiliary fuel tank under the aircraft's nose, were the only distinguishing features of the Night Lightning. It was designated the P-38M and was used during the closing weeks of the Pacific war. Four .50 caliber machine guns and one 20-mm cannon were mounted in the nose. Five-inch rockets were carried on inverted "Christmas Tree" cluster launchers underneath each wing. Jettison-type fuel tanks gave it an operational range of 1,700 miles, like its day-fighter brother. Radar detection, together with the fire power from a salvo of ten rockets make the Night Lightning lethal against ground or sea targets, as well as against enemy aerial night prowlers.

(Air Force)

Fiberglass Fabrics:

When a serious shortage of canvas developed during 1944, the Army tried fiberglass fabrics as a substitute. Under the sponsorship of the Corps of Engineers, fiberglass fabric was improved and used in making 3,000-gallon portable water tanks and airplane hangar curtains and doors. Unaffected by mildew, this material found much use in the Pacific.

(The Military Engineer)

"Very Short Pulse Waves":

The Army Signal Corps comes up with some figures to illustrate what it means when it says that the newest radar sets send out "very short pulse waves."

Radar serves, among other things, to measure the distance to a target. This is done by projecting short pulses of radio waves. The pulses strike the target and are reflected back to a receiving set. In the receiving set the pulses are caught by cathode-ray tubes which show the location of the target with spots of light.

In order to provide accurate plotting of range to the target, the pulses must be exceedingly short in duration. Some of the early radar sets were able to send out quite short pulses; they lasted five-millionths of a second. But improvements were made with succeeding sets.

The Signal Corps has released a description of the latest set designed to locate waterborne targets for the coast artillery guns. The pulses from this new radar set last one-fourth of one-millionth of a second.

(Army and Navy Register)

High-Speed Wire Laying:

New equipment by which combat wire in coil form may be laid by airplanes or vehicles or paid out by bazookas and rifle grenades without the use of reels has been developed by the Signal Corps and is now in production.

A special coil and dispenser have been designed and successfully tested with rifle grenades, bazookas, man pack, certain types of vehicles including the amphibious DUKW, and from a liaison-type plane which paid out wire at speeds as high as 110 miles an hour.

The dispenser is about one foot in diameter, half a foot long, and weighs approximately twenty-five pounds. It contains about 3,300 feet of assault wire. It can be mounted on an infantry packboard or carried by the use of a shoulder strap or by hand. Communication may be maintained during the pay-out process, regardless of the method used for transportation. Two or more wire dispensers may be connected in tandem when it is desired to lay more than one coil of wire without stopping to make a splice.

A container has been designed for use by the Army Air Forces which has a capacity of eight wire dispensers, making it possible for planes to lay a continuous five-mile circuit.

(Army Ordnance)

Plastic Protection for Ships:

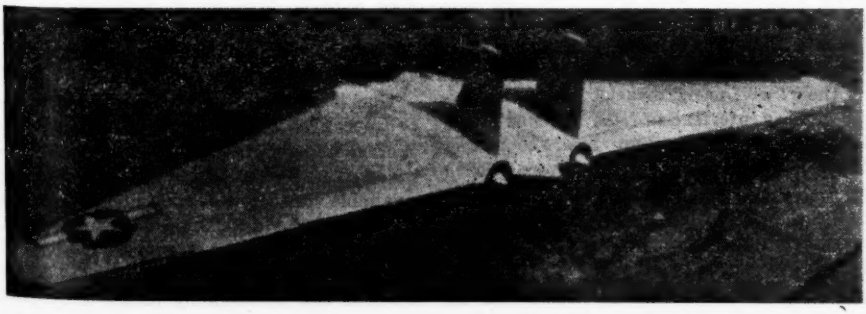
When final plans are carried through the Navy will have a laid-up fleet of 2,204 ships in reserve.

To protect the outer skin of the vessels, a poisonous hot plastic paint is applied to the hull. This will kill barnacles or any other life that attempts to cling to the vessel's bottom.

In addition an unusual new technique has been developed to protect topside equipment. This is the weaving of a moisture-proof web by spray gun. Entire gun mounts are covered by means of these webs.

(Army and Navy Journal)

Jet-Propelled Flying Wing:



Pictured above is the XP-79, a small flying wing fighter built experimentally for the AAF. This is the first U.S. built flying wing which is powered by jet engines. One of the distinctive features of this plane is that the pilot lies in a prone position, to enable him

to withstand twelve G's on pullouts. The aircraft was designed as a fighter, carrying four machine guns.

(Aviation News)

The "Huff Duff" Direction Finder:

Many men and many methods have shared the credit for the ultimate defeat of the U-boat during World War II. Prominent among the instruments which figured in this important program was the electronic "finger" which pointed straight toward enemy submarines the instant they started to use their radio transmitters. It was employed by the United States Navy in winning the "Battle of the Atlantic" but only recently has the technique been disclosed to the public.

It is known as a high frequency direction finder, or, HF/DF. But with the penchant of Americans for giving pat names to involved devices it has been corrupted into "Huff-Duff."

The effectiveness of the new direction finder depended upon the use of their radios by enemy U-boats hence the care in guarding the secrecy surrounding the development. Nazi submarines did use their radios and continued to use them, even when they were being located and destroyed in rapidly increasing numbers.

It was well known to naval officers that enemy submarines used *Kurier*, or "squirt," transmission—a system of radio communication in split-second bursts—to their bases in occupied territory, to one another in organizing their "wolf-pack" attacks, and in conveying weather information from this side of the Atlantic to the German high command. These "compressed" messages were picked up at the enemy receiving station on high-speed recording devices which later "stretched" the recorded message by playing it back at reduced speed.

The continual plotting of submarines by direction finder networks enabled the Navy to reroute Allied convoys so as to avoid individual submarines or "wolf-packs" stalking the convoy lanes of the Atlantic. The Navy's intercept stations ashore ranged from Jan Mayan, a small island between Iceland and Spitzenbergen, all the way south to Bahia, Brazil.

It was believed by the enemy that the brevity of these radio contacts forestalled detection by any devices known to them. They were, of course, unaware of the new American direction finders on escort ships which revealed the location of the underseas craft the instant they started to transmit, no matter how briefly or how far away.

As is well known, radar does not operate beyond the theoretical line of sight since its radio waves do not bend with the curvature of the earth. Its range, therefore, against submarines or surface raiders is not more than thirty miles. The new direction finder has almost no range limitation. When a submarine surfaced and used its radio, the direction finders on the American escort ships pointed to its location. Two of these bearings gave its exact location mathematically. If the submarine was in their operating area, the escort ships followed the direction finders' indicated courses and put radar within range for definite "sighting" if the sub remained surfaced, or put the sonic devices on a "sound trail" if it submerged. Then the depth charges and guns finished the job.

Although most of the wartime use of the direction finder was against submarines, it was equally effective in locating, at long range, airplanes in flight and surface ships. These are the valuable peacetime applications which were demonstrated.

The location of an airplane crossing the ocean can be determined immediately by direction finders. Installations now being provided on both sides of the Atlantic will make available to a trans-oceanic pilot, who might be having navigational difficulty, a service which will give him his exact position at any time he requests it. Furthermore, these stations can immediately obtain a pin-point location of any plane in trouble and relay it to the nearest ships and shore rescue stations.

(The Nautical Gazette)

FOREIGN MILITARY DIGESTS

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Principles and Rules to be Observed in the Employment of the Services

Translated and digested at the Command and Staff College from a Portuguese article by Lieutenant Colonel Antonio Moreira Coimbra in "A Defesa Nacional" (Brazil) April 1946.

THE voluminous task which falls to G-4 in any staff, and particularly in the services, in preparing to carry out the decisions of the commander, demands above all, method, order, and a thorough understanding of the part which this section plays in the planning and carrying out of those decisions.

Two questions involved in the solution of the "service problem" are the disposition and the operation of the services. One is a tactical and the other a technical question, and though they may appear to be complex at first, they become greatly simplified if a certain number of vital principles of organization and operation and rules relative to disposition are followed out in all situations.

The explanations contained in regulations which deal with this subject are clear, and in view of the familiarity with these regulations on the part of those who devote their attention to these matters we shall refrain from unnecessary repetition by dealing here with such vital principles of organization and operation as simplicity, economy, flexibility, and security, and confine ourselves instead to an examination of the rules.

Some of the rules relative to dispositions are characterized by consistency and others by variability of employment, in accordance with different phases of operations. If the principles are adhered to, the rules represent the foundations of a good solution.

Thus, in concentration the important thing is to take advantage of existing installations or those which were prepared in time of peace, with the minimum deployment of the component elements of large units. It is especially important that this rule be followed in the preliminary phases of combat.

In the attack, the disposition and efficient functioning of the services are governed by the following rules which are peculiar to it:

1. In planning the disposition of forces to handle a situation, always maintain some units in reserve, bearing in mind the need of moving units by echelon. If possible, utilize units which have already been handling a preceding situation (defense, for example) in the same positions, reinforcing them with other units in reserve and replacing the first units as soon as success is evident, in order to be able to handle any new situation.

2. Move forward, along the routes of communication, those units and installations which are required for supply during the battle and during the phase of the exploitation of the success. This should be done with a minimum of change in the disposition of the services, and always observing the requirements of security, secrecy, and concealment.

3. In the disposition of the services, seek the flank which is least exposed. This disposition must however be governed by the routes of communication, the antiaircraft defense, the disposition of troops, and the capabilities of the service units.

In the defense, the disposition and operation of the services are governed by rules which leave no room for doubt relative to the above. They are:

1. Deploy service units and installations in depth, along the routes of communication, observing the requirements of security, secrecy, and concealment, and in the absence of adequate antiaircraft defense, avoiding existing installations. This must be done within the following limits:

Rear limits: Fixed by higher echelon, and governed by the radius of action, capacity, and availability of transportation.

Forward limit: Army units—Out of enemy observation and beyond the range of his heavy artillery.

Division units—Out of enemy observation, and beyond the range of his field artillery.

Units below division level—Out of enemy observation and beyond the effective range of his automatic weapons.

2. The disposition must be such as to permit the functioning of all the elements of the services, maintaining in reserve only those elements which are indispensable to the support of counterattacks, and it should be characterized by continuous improvement and perfecting of installations.

3. The disposition of the services should always seek the least exposed flank, but it must be governed by the routes of communication, the antiaircraft defense, the troop disposition, and the adaptabilities of the service units.

In a withdrawal, it is needless to add that in the new defensive position the rules peculiar to the operation conform to the above rules for the defensive. However, in the initial and temporary conditions, the secrecy of the operation and the retrograde nature of the movement require that the services free the roads as soon as possible and that the heavy units be taken immediately to the protection of the new position. This must be done without knowledge of the enemy, which is a difficult thing even at night, without air superiority, when one considers the means which modern reconnaissance aviation has at its disposal.

The application of the above principles and rules does not excuse one from the observance of the "rule of dispersion," figuratively expressed by the North Americans in the sentence "Don't put all your eggs in one basket." This in view of the attraction which certain topographic features offer in the location of service units and the targets which they offer for shelling and bombing (the latter, especially) in spite of the local cover which may exist in the area.

Stability of Modern Defense

Translated and digested at the Command and Staff College from a Russian article by Lieutenant General P. Iarchevsky in "Krasnaia Zvezda" (U.S.S.R.) 17 April 1946.

THE experience of this war suggests that some questions pertaining to the organization of defensive positions should be revised. The necessity of this revision is dictated by the increased fire power of artillery and aircraft and by their effect upon the position of the defender and especially upon its tactical depth, that is, upon the main defense zone manned by the first echelon.

In positional warfare, it is highly desirable to stop the advance of the enemy before he reaches the main line of resistance. In order to do so, one must concentrate men, equipment, and supplies in all threatened directions, and particularly in the immediate proximity of the main line of resistance, for it is against this line that the enemy concentrates all his forces of destruction. Under these circumstances, how can we protect our main forces from massed artillery fires and bombing and prevent the enemy from upsetting our organized resistance? This is one of the most important problems of modern defense.

The defender must not let the attacker disrupt the organization of resistance at the main line of defense, and the defender may undertake various measures, of active or passive character to increase the stability of his defensive organizations. Among these are the use of false lines of defense, the increase of the depth of defensive positions, and the employment of mobile fire emplacements.

False Lines

The creation of a false main line of resistance is difficult. Such lines have been used since the beginning of massed artillery preparations and were once considered one of the most effective means for the protec-

tion of the defenders from the action of hostile artillery. The difficulty of the employment of such lines lies, first of all, in determining whether the false line is to be built in the most threatened sector only as necessity arises, or whether it should become a permanent element of the defensive zone, beyond which is concealed the actual main line of resistance. It is very important to determine how far from the actual main line of resistance one should build the false line, and to what extent one should go in expending forces and equipment in building it.

In the light of our war experience it appears that the creation of false lines, only in the decisive direction, in the form of a reinforced outpost line is obviously unsatisfactory. Such lines are too primitive; they are easily detected by the enemy and consequently do not serve their purpose. This difficulty was often solved in a different manner. In positional warfare, the first few trenches of the main defensive zone were really the advance position, that is, the false main line of resistance. In back of this advance position, about 500 to 1,000 meters from it, was located the main position of resistance and still farther in, the reserve position. Such an organization of defense soon became known to the enemy and lost all its advantages.

As is known, when time is available, the main defensive position is converted into a formidable net of trenches, communication trenches, and other engineering works. The main position in one of the sectors may sometimes coincide with the second line of trenches in another sector, then pass over to the third line in another, and include several separate centers of resistance. Thus, a broken line which really constitutes the main line of defense is created. The forward edge of the entire defensive zone then loses its significance as the main line of resistance and becomes the false main line of resistance.

In a well developed defensive position measuring about six or seven kilometers in depth, it is difficult for the enemy to detect the broken line or the main line of resistance. But this happens only when all false positions are built carefully and so well that even the troops manning the position often do not know where the real position is located. Such a defensive position cannot be built hurriedly, for its creation is a slow and difficult process.

How far from the false position running along the forward edge of the defensive zone should the main line of resistance be? It should be remembered that we cannot altogether protect the main position from artillery shelling. All we can do is to place it a short distance away from the center of hostile artillery action.

Let us consult the experience of this war. It is well known that during artillery preparations seventy or eighty per cent of all projectiles generally explode within a zone extending about one kilometer from the actual or observed main line of resistance (forward edge). Only twenty or thirty per cent are intended for objectives located in the rear areas. Deep in the rear areas, artillery objectives cannot be well observed and the action of the artillery assumes the character of area fires which are much less effective.

These observations are not intended to prove that the main position should always be one or two kilometers away from the false position. As long as it is more advantageous to have the main position built in the form of a broken line, it can either extend to the depth of one kilometer from the false line or be as close as 300 or 400 meters to it. One should not forget, however, that the troops defending the false position should not be so far away from the main position as to affect their tactical cooperation with the latter.

In determining the number of troops to be used for the defense of the false position, one should keep in mind that the manning of this line should not weaken the force defending the main position. On the other hand, it is perfectly useless to have a weak false position. It is difficult to say whether we should use one-fourth or one-third of the forces of the first echelon, but one should try to have false position protected with an effective

system of fires and see to it that all dummy or false works give the enemy the proper impression.

Greater Depth of Position

Let us now consider the problem of increasing the depth of the position for greater security of the troops manning the main position. The depth of the defensive position is the depth of the disposition of the troops which are directly engaged in battle. In certain sectors, our defensive positions were ten or fifteen kilometers deep and consisted of two or three lines or zones of defense. Each of these was about four or five kilometers deep and had two or three lines of trenches. These zones often merged with each other. Such a defense was used when there was a threat of a large-scale attack, when the defense in the decisive direction had a very high troop density, and when there was sufficient time for the development of the position. It is believed that in the positional warfare of the future, decisive or important sectors will have similar or even deeper defenses. The further development of engineering tools will facilitate the construction of defensive zones of considerable depth. This will have an important practical significance. First of all, the increase in depth of the defense will enable us to avoid dangerous over-crowding of the main zone. Second, it will be much easier to build various dummy constructions intended to confuse the enemy as to the true system of defense, and in addition, it will be more advantageous in carrying out all types of tactical maneuvers by the first echelon and will offer more space for the organization of resistance.

It is not the purpose of this article to consider in detail the methods which might be used in deepening defensive zones. Suffice it to say that this deepening will assume the form of a series of positions tied in with one another, not only by fortified works but also by the disposition of troops. As for the distance to be maintained between the main line of resistance of the second defensive zone and that of the main position, this will probably be increased and vary between twelve and seventeen kilometers.

Mobile Weapon Replacements

Positions in the World War I were characterized by trenches with numerous machine-gun nests. In this war, to reinforce field defenses we used timber and earth, stone and earth, and steel and cement works, and pillboxes. However, as the artillery proved its ability to destroy everything observed and everything stationary, we began substituting stationary emplacements with mobile weapons emplacements.

These were either separate groups of submachine guns (or machine guns) which could change their firing positions, if necessary, or armored mobile installations in the form of tanks or self-propelled guns, or special combat machines capable of movement. Mobile armored emplacements left their shelters, went into battle positions at the start of the attack, and fired point-blank at the attacking enemy.

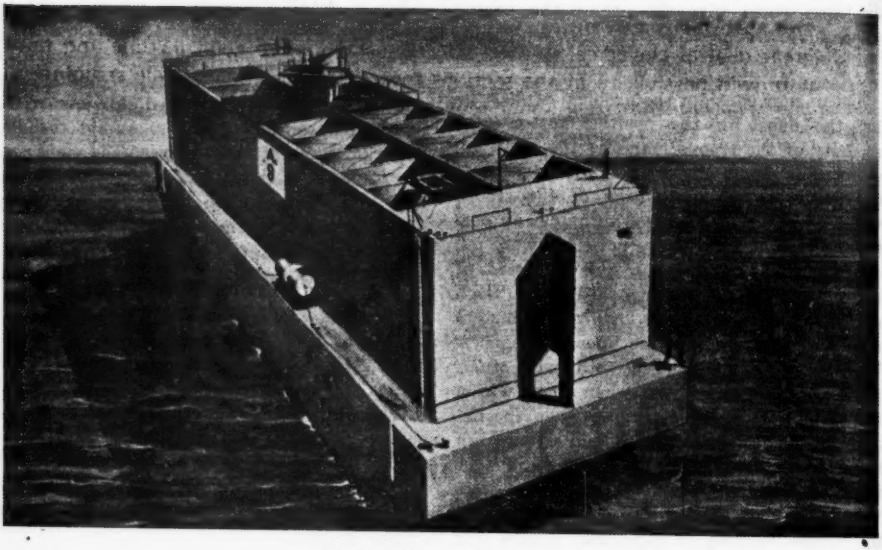
In the future, it is believed there will be an increased demand for mobile defenses, and their maneuverability and effectiveness will undoubtedly be increased.

The Prefabricated Harbor

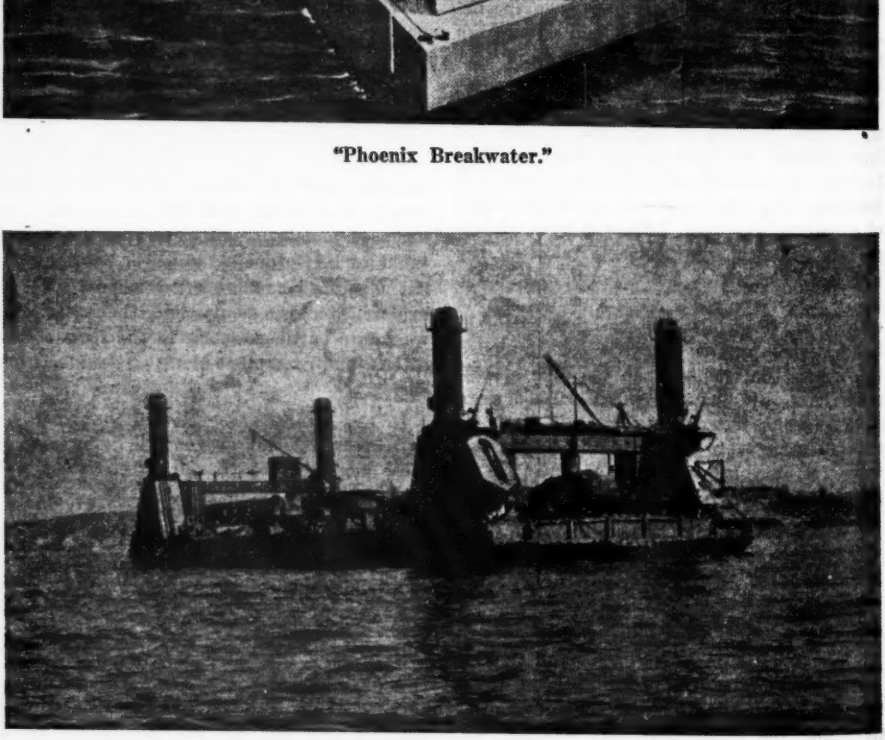
Digested at the Command and Staff College from an article by Rear Admiral H. Hickling, in "Journal of the Royal United Service Institution" (Great Britain) August 1945.

WHEN it came to invading the Continent we had two enemies to reckon with: one was the Germans, the other was the weather. Of these two enemies, by far the most unpredictable was the weather.

The landing of a huge army with a "Build-up" of millions of tons of equipment and stores called for all the appliances of a major port. We might, of course, land over open beaches but that would put the "build-



"Phoenix Breakwater."



"Whale Pier."

up" at the mercy of the weather. Hitler had said, "If we hold the ports we hold Europe," and the Germans meant to hold the ports. We had had a taste of assaulting a major port at Dieppe. To have attacked Cherbourg, for instance, would have been a costly, a lengthy and bloody business forfeiting any element of surprise. Nor was the alternative of landing over open beaches acceptable because no prudent commander was going to leave his "build-up" to the mercy of the weather in the English Channel.

The Plan

General Morgan conceived a plan whereby he would assault over the open beaches where the defenses were relatively weak and take a couple of harbors along with him. His plan was calculated to spring a major surprise on the enemy which, as we know in the light of later events, it most certainly did.

On 4 September 1943, we who were waiting in London received the signal telling us to get busy with two artificial harbors, one in the American sector at a place called Saint Laurent to be known as Mulberry "A," and one in the British sector at Arromanches, ten miles to the eastward, to be known as Mulberry "B." The harbors were to be prefabricated in the United Kingdom, towed across the Channel and put down in fourteen days. Each was to be the size of Dover which took seven years to build. These two harbors were to supply between them at least 12,000 tons of stores a day irrespective of the weather. That was only one-third of the total the armies required each day, which was of the order of 40,000 tons, but there had to be a guarantee that no matter what happened, whether it blew or snowed, a proportion of the stores would be landed.

Owing to the flatness of the foreshore off the Normandy coast, ships could not anchor closer in than four to five miles from the beaches, which meant that there had to be thousands of landing craft, barges, etc., ferrying the army's stuff ashore. If it came on to blow from the north and there was no protection for these craft, they would be driven ashore and wrecked, so that when the weather abated there would be nothing left to ferry the stores ashore; then the army's life-line would fail and they would be at the mercy of the Germans. So not only were two artificial harbors—the Mulberries, required, but also five small-craft shelters, known as "Gooseberries," one on each beach. These five shelters were needed from the word "Go," not only to provide protection from the weather but also to give facilities for landing craft to be serviced and repaired and for their crews to get meals and rest. They were provided by block ships, sunk in about twelve feet of water, which made a breakwater about a mile long.

Blockships

The first form of breakwater and probably the simplest was the blockship which was used for the Gooseberries. They consisted of such old merchant ships as we could get hold of and they had the great advantage that, being mobile, they did not require any tugs, for in this venture tugs were worth their weight in gold. They could get themselves from "A" to "B" and maneuver themselves roughly into position, and so provide essential protection from D-day onwards. They were ballasted to draw about nineteen feet of water, and filled with explosive charges of ten pounds of amatol on each side of each hold, which were connected up electrically to a central firing key. When they were in the right place to be "planted" as we called it, the charges were fired and blew a hole three feet below the water line, and down the ships went. We also had alternative methods of firing by time fuse.

The depth of the average tramp-ship such as we got, is of the order of forty feet from keel to upper deck. This meant that, with the rise of tide of twenty-three feet, the depth in which the blockships could be sunk to make effective breakwaters was about fifteen feet at low water. A breakwater which is submerged at high water is not much use.

The intention was to sink the blockships in shallow water—say fifteen feet and then to extend that breakwater east and west into

deeper water by means of concrete caissons—the Phoenixes, which I will describe shortly.

Bombardons

Outside each harbor, it was decided to put down a mile of floating breakwater called the "Bombardon." This was an entirely novel form of breakwater. We actually got three mammoth rubber mattresses, each 200 feet long and about fifteen feet in diameter. The concrete keel alone weighed 750 tons.

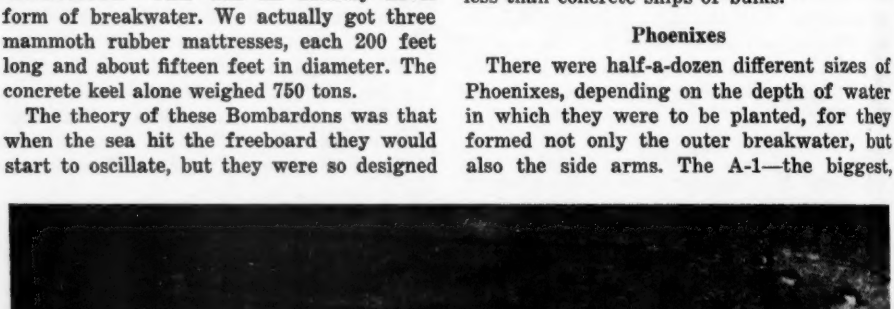
The theory of these Bombardons was that when the sea hit the freeboard they would start to oscillate, but they were so designed that the period of these oscillations would never come into phase with the period of the waves which it was intended to suppress. The wave for which they were designed and which we expected off the Normandy coast was 200 feet, crest to crest. The Bombardon had the advantage that it could be moored in comparatively deep water, say sixty feet, which would enable deeply-laden Liberty ships to anchor in its lee and discharge their cargoes under those difficult conditions.

The Blockships and the Bombardons were a naval commitment. Now we come to the army's part—the concrete caissons known as Phoenixes and the Whale Piers.

The depth of the blockships confined them to comparatively shallow water and, in order to provide breakwaters behind which Liberty ships drawing twenty-six or twenty-seven feet of water could berth, we had to go into the concrete business. The War Office designed the Phoenixes, which are nothing more nor less than concrete ships or bulks.

Phoenixes

There were half-a-dozen different sizes of Phoenixes, depending on the depth of water in which they were to be planted, for they formed not only the outer breakwater, but also the side arms. The A-1—the biggest, was 200 feet long, by sixty feet high and forty feet beam. These "blocks of flats" had to satisfy various conditions, the first of which was that they had to be towable, and that is why they were given swim (upswept) ends. They also had to be stable: that is, they had to remain on an even keel while they were being planted, for we did not want them capsizing. But most important of all, as far as the navy was concerned—and it was the navy who had to "plant" them—was that they should sink quickly. You can imagine that "planting" a 6,000-ton hulk with forty feet freeboard to catch the wind in any sort of breeze and with a cross tide is no mean feat of seamanship, for they had to be placed with an accuracy not of feet, but of inches.



The Harbor at Arromanches.

Whale Piers

Sheltered water having been provided for, the next most important thing was the means for rapid discharge of stores, vehicles, etc.

The result—the "Whale," was probably one of the finest pieces of bridge engineering the world has ever known. I think I am right in saying that this was one of the most ingenious pieces of engineering of modern times. It consisted in the main of two principal elements—the pierheads, of which twenty-three were made, and the floating pier roadway which connected the pierheads to the shore. Ten miles of this equipment was ordered. The pierheads consisted of a rectangular steel ship 200 feet long, sixty foot beam and about eleven feet deep. At each corner a leg or spud, ninety feet high and four feet by four feet cross section, was fitted, and by means of winding machinery it was possible to move these legs up and down. When you wanted to tow the thing over to France, all you had to do was to press a button and wind the legs up into and above the body of the hull. When you got it to where you wanted it, the man in the control tower would press another button and the legs would be lowered down until their spud feet buried themselves in the sea bed. As the four legs were independent, no matter what the inequalities of the sea bottom, they would take up their own level and moor a horizontal pier weighing in all about 1,000 tons, which could go up and down with the tide.

A stores pier, which could take a load of twenty-five tons, consisted of seven pierheads placed in a continuous line in a depth of eighteen feet at low water. There coasters could berth and discharge at all stages of the tide. These pierheads were connected to the shore half a mile away by means of the floating pier roadway. The latter consisted of eighty-foot steel spans supported on specially designed floats.

If you try to resist water you set up very big stresses; it is much easier to give to the sea than to resist it. The principle of the floating pier roadway is one of flexibility—controlled flexibility, and there was nothing rigid in these spans.

Surveys

While we were building the 1,000,000 tons of prefabricated ports, the navy was making surveys of the coast of Normandy where the harbors were to be constructed. We sent out reconnaissance parties who swam in at the dead of night in bitterly cold weather right under the noses of the German sentries to obtain the information we required. They carried out surveys, obtaining soundings, tidal information and, most important of all, information about the composition of the sea bed, so that we should know whether we were building our harbor on rock or on sand.

The Crossing

By superhuman efforts the assembly was completed and the units made ready for sea just about the time the assault forces were leaving harbor on D minus one. The first Mulberry left harbor in the evening of D-day. For purposes of planning we had worked out an integrated towing program because each unit had to be moved into the harbor in its proper place and proper order at the proper time. Of course we realized that with so many unknown factors, including enemy action, our program would never be strictly adhered to, but it provided a very good guide.

Each night, depending on the weather forecast, the following units were dispatched to each Mulberry:—

4 to 5 Phoenixes.
6 Bombardons.
2 or 3 Pierheads.
4 or 5 sections of Pier Roadways.

The work of building the harbor went reasonably well for the first few days, the Gooseberries being finished on D+5. By D+8, the Bombardon had been finished and was giving very good results with a wave suppression of about forty per cent. By D+10 the Mulberry breakwaters were about half completed and the Whale Piers about one-third.

The Great Storm

About 1530 on Monday, 19 June (D+13) it started to blow and it blew for three days and three nights, such a summer gale from

the north as had not been known for eighty years: it was a gale which was comparable only to that which in 1588 dispersed the Spanish Armada, and had we not had the Gooseberries and the half-completed Mulberries I think the Allied armada would have shared the same fate as the Spanish; it is a solemn thought that so much hung on that slender thread.

At Mulberry "B" a certain amount of damage was done. Nevertheless the harbor began to take shape and by about D+30 we were working up to an average discharge of about 9,000 tons a day: 2,000 tons more than the harbor was designed for.

Conclusion

People have asked, "Was the Mulberry a sucess?" and "Was it justified?"

Up to the end of August 1944, a million tons of stores were landed over the British sector; of that, half a million came through Mulberry and it came every day no matter what the weather, and even when discharge over the open beaches was reduced almost to nothing. At the height of the gale we were still able to get 800 tons of vital ammunition ashore to our artillery when things on the bridgehead were not looking too good.

Was it justified? I think the answer is "Yes," because had we not provided this administrative insurance that at least a trickle of stores would get to our armies every day no matter what the weather, the invasion of the continent would not have been undertaken.

Mr. Churchill, who came and spent four days with us at Arromanches, just about summed it up in his message when he left. He referred among other things to "this miraculous port which has made possible the liberation of Europe."

Collapse of the Wehrmacht

Translated and digested at the Command and Staff College from a French article by Lieutenant Colonel Charles de Cosse-Brissac in "Revue de Défense Nationale" (France) March 1946.

MOST recent events are not always the best understood, nor even the best observed. Only in the light of history can they be correctly evaluated. However, it is perhaps not too soon to cast a glance over the doctrines and methods which have inspired and governed the course of World War II. This study can go no further than to indicate the most important of the problems involved. We desire to center it around the great instigator, the actor who played the principal role in this long drama, the Wehrmacht. We propose to study the concepts which presided over the new German methods of warfare, to attempt to sum up their principal features, to recall briefly their extraordinary and brutal success, then their decline, and finally their collapse.

It is difficult for a people who are peaceful by nature and respectful of the rights of other nations to comprehend what war means to the German mind. It is the condition on which depends the existence and grandeur of the *Volk*. The German state cannot be realized except by opposing the "German people" to "non-German peoples," except by forging "with iron and fire," first Germany, and after that German Europe.

Springing from the lowest stock of the people and from the lowest ranks of the army, crafty, inspired, animated with fierce energy, and endowed with a type of eloquence suited for the swaying of crowds, Adolf Hitler spread the Gospel of Force which had been slowly elaborated by the thinkers and savants. Placed in office by universal sufferage,

he seized possession of power and won more absolute control over the masses than the most powerful of the German emperors had ever known. His propaganda aroused an extraordinary response in the German soul. The German race, pure and free of all alloy, was made to dominate the world. The German sword must be forged anew. Great Germany must be re-made. As soon as he had come into power, Hitler had given work to six million unemployed, and had given life to a heavy industry surpassed only by that of the United States. The Germans were to be the Master People.

For more than two centuries Germany had possessed an admirable instrument of war: her army, the binding force of a unity which long had been precarious. Its staff was recruited from the intellectual and social elite of the country. A succession of eminent doctrinarians, each of which remained for a long time in directive positions with the Great General Staff, provided this laboratory of war with a continuity and authority unequalled elsewhere. One after the other codified the doctrines of military science, drew lessons from successive wars and adapted them progressively to the newest scientific and industrial innovations, going in each instance beyond the experience that had been acquired in order to meet the conditions of the war of tomorrow. Suppressed by the Treaty of Versailles, the War Academy nevertheless maintained an underground existence and influence until the time of its restoration by Hitler in 1935. Great military spirits continued to forge its doctrines.

The New German Doctrine of War

In World War I we found continuous and inviolable fronts opposed to one another. The breakthrough of these fronts required the accumulation of forces much superior in strength to the defense. The experience of 1918 permitted our estimating this at three times the amount of infantry, six times as much artillery, and twelve times as much ammunition. In addition to this it was imperative that it be executed on as broad a front as possible—the situation for an attacking wedge which penetrated into enemy territory for a distance of more than half that of the breadth of its base was regarded as hazardous. Motorized transportation operating over a well-kept network of highways and roads now permits concentration of masses of the attacking forces at considerable distances from the front and leaves the defense uncertain as to the time and place of attack.

By 1918 the tank, due to lack of speed and fast accompanying weapons, had not yet been used to exploit a breakthrough. Alone, the tank is powerless. It must be accompanied by infantry trained in its protection, by artillery capable of providing it with accurate and immediate fire support, and by combat engineers who are able to clear obstacles and restore communications.

The new motorized ground arm is closely dependent on the aerial arm. Aviation insures mastery of the air, and control, protection, and secrecy of approach. It reconnoiters and bombs the enemy's dispositions and rear areas. With relative precision and with a speed heretofore unknown, it drops quantities of explosives greater than those which could be dropped in the same period by artillery.

For the cooperation between the aerial arm and the ground arm to be effective and rapid, a system of signal communications which is dependable, simple, and free of defects, is required.

The new army will come up against the tanks and aircraft of the enemy. It is of importance to provide all echelons with powerful antitank and antiaircraft weapons, and to inculcate the necessary reflexes for putting them into use.

These new concepts are followed by certain consequences.

From the standpoint of tactics, it becomes possible to make the main effort of the attack, not over a wide and inevitably costly front but at one or more relatively narrow sectors, with a superiority of fire power that will neutralize the enemy's antitank weapons without giving them an opportunity to perform. Infiltration is practiced by tanks on the

same basis as in the case of the infantry. The tanks advance as far as possible when a gap is discovered, ignoring or detouring around obstacles or resistance, thus enlarging the initial breach through which the motorized divisions pass followed by the infantry divisions.

In Germany, nothing remains an intellectual concept for long. Will is translated into action which is methodically carried out on a colossal scale. The Spanish war served as an experimental phase. High quality informants and experts, and even entire formations were sent to try out the new equipment and methods. The defeat of the Italian motorized division at Guadalajara revealed that motorized action must be brutal, rapid, and deep, and that its success involves mastery of the air.

In Germany, the high commands were made ready, and large units organized, trained to a fine point, and given their final polish in modern camps. Outside the army, there was a long-range motorization program. A large automobile industry was developed in giant strides, and a great number of automobile highways, whose ultimate purpose was a strategic one, crossed the German countryside.

The Test

By 1 September 1939, the "White Wars" of Austria and Bohemia were over, and the stage was cleared for World War II.

The first campaigns, in Poland and Norway, were easy demonstrations of the superiority of the new German weapons. The Polish army was brave, but possessed few planes and tanks. Besides, it did not even have time to mobilize. Thirty of its sixty divisions faced the ninety German divisions alone.

The Campaign in the West constitutes the classical type of "Blitzkrieg." In forty-five days the French army, which since its victory over Germany in 1918 had been considered as one of the best in the world, was brought low with scarcely time to take account of the situation.

As a matter of fact, the French army was surprised. It suffered a technical, tactical and strategic surprise. As soon as news of the German invasion of Holland and Belgium was received, its chiefs stretched its front out to a dangerous degree and committed their motorized reserves prematurely. The German Supreme Command, executing "the most improbable maneuver at the most improbable place" hurled forward, between Namur and Luxembourg, seven armored and three motorized divisions followed by the three armies of von Rundsted's Army Group. The rest is well known. The drive of von Kleist's forces to Abbeville, the destruction of the northern Allied group of armies, paralyzed on the highways by the columns of refugees, exposed without defense to the attacks of the German aviation which was everywhere master of the skies.

Indeed, the Germans had superiority in all spheres. And such numerical superiority both in personnel and matériel that it is hard to see how there could have been any other outcome to the conflict even if Germany had not likewise demonstrated the qualitative superiority of her war machine and her methods of employing it.

At the conclusion of the campaign the Wehrmacht codified its new experience, recasting the regulations of the armored army. They formulated the principle of the *Keil*, or motorized wedge, driven into the enemy front for the purpose of effecting a breakthrough with the help of the closely combined action of the various arms. They lightened the panzer division, leaving it but one regiment of tanks, increased the proportion of heavy tanks, and developed the concept of armored self-propelled artillery capable of giving more permanent and flexible support to tanks.

The short Balkan campaign repeated the demonstration of German invincibility by cleaning up the Serbian and Greek armies which were reinforced by a British expeditionary corps.

The Russian Campaign

Up to the time of the Russian Campaign the German aggressions had been conducted

with forces much superior to those of their victims. When, on 22 June 1941, Hitler crossed the German-Russian frontier without warning, his forces, including Finnish, Hungarian, Slovakian, Italian, and Rumanian contingents, did not come up to 200 divisions. Opposed to him, the Russian army was able to provide 175 infantry divisions, thirty-five cavalry divisions, and sixty armored brigades, or 10,000 tanks. This first commitment of forces was far from exhausting the military effort of Russia for, in spite of the losses she suffered, the Red Army had more than 500 divisions and 170 armored brigades in 1943.

From this point on, the Russian front was the essential front—as the French front of 1914 was. Once again the German army was victorious, annihilating its foes. The "pincers action" of its armored armies accounted for large numbers of the Russian forces. It took hundreds of thousands of prisoners but permitted the main bodies of Soviet forces to escape each time. The Russian Supreme Command did not yet consider itself able to deal the decisive blow. It prepared to give ground in order to be able to hold out. The problem was to diminish the speed of the aggressor—an indispensable factor in "Blitzkrieg."

The German army was engaged against the resistance of the fortified lines that opposed it: the line constituted by the frontiers, the Stalin line, and the defenses of Stalingrad and Moscow. Everywhere, the Russians defended themselves stubbornly, and their resistance was prolonged in the form of guerrilla activity against communication lines. The German army suffered heavy losses in the game.

The territory of Russia broadens out as one moves from west to east. The front involved in the operations at the beginning of the campaign extended over a distance of some 1800 kilometers. By the end of autumn 1941, it extended some 2500 kilometers. By the beginning of autumn 1942, it was to extend over a distance of more than 3600 kilometers. In addition to this, it is 1200 kilometers from Brest-Litovsk to Moscow. Stalin practiced a "scorched earth" policy. The Germans were not able, therefore, to find the reserve supplies necessary for keeping their army alive. It was necessary to reshape everything and transport everything that was needed over a long distance. Danger from guerrilla fighters immobilized considerable forces.

After the dusty summer, came autumn and mud, that "fifth element" of the Russian plains which had already tormented Napoleon. Operations were brought almost to a standstill. With the winter appeared the snow and cold, deadly to both men and motors. The men were not dressed for winter nor were the vehicles equipped for it. But Hitler was determined, regardless of cost, to seize possession of Moscow and Leningrad.

The Siberian troops who so far had been held in reserve went into the lines, and the workers of Leningrad and Moscow were organized into divisions. An unusually cold wave came on. The Germans were forced to beat a retreat, leaving their frozen tanks behind them.

In the month of May the German army broke up a Russian offensive and, after an extremely difficult seige, finally gained possession of Sevastopol. Here again the Soviet fortifications and artillery imposed frightful losses on the Germans reminding skeptics of the role still played by these in modern warfare. The German army then made a considerable effort over a front of 350 kilometers. The Russian troops methodically beat a retreat, still opposing their pursuers with the "scorched earth" policy. The Alpenjäger planted the German flag on Mt. Elbrouz but, as at Moscow the preceding winter, the German tanks ran into hard going at Stalingrad. This great city, which was destroyed little by little, resisted the attacks of the tanks and Stukas furiously fighting in its ruins.

Simultaneously, fortune was changing sides in Africa. The motorized forces of the Axis and the Allies which had oscillated back and forth between Benghasi and El

Alamein, were mutually blocked, facing one another at the end of the summer of 1942. After a succession of unfortunate battles, the Allies had succeeded in establishing themselves on the El Alamein line, the last obstacle before reaching Alexandria. Rommel, whose overly long communication lines were being subjected to the attacks of the Royal Air Force, pressed them in vain. Montgomery pounded the German-Italian front with aviation and artillery, and then chased Rommel for 1200 kilometers.

On 8 November, the Americans landed in North Africa, and the French army there resumed the struggle at the side of the Free French Forces and the Allies. Germany had lost the initiative. She was witnessing the beginning of ground operations on two fronts, a situation which had been so feared by her strategists since 1918.

As a matter of fact there had already been several air fronts for a long time now. The preponderance of Anglo-American aviation on the western and southern fronts had forced the Luftwaffe to draw heavily on her forces in Russia. German arms saw their last and best trump disappear from the Russian skies. Hitler continued his attempt to take Stalingrad, and it was Stalingrad that was the symbol of the final collapse.

From this time on the German army was inferior to its adversaries everywhere because of its enormous losses in men and matériel. It had reached the limit of its manpower. Its industrial production was still steady but it was being outclassed by the formidable American arsenal. Even its qualitative superiority was now in question. The German army was obliged to go over to the defensive.

The Russians formed large artillery units: thirty divisions in 1943. The Germans followed their example on a reduced scale. They made up large and small artillery brigades sometimes called divisions, or corps, and comprised of from four to six groups or some eighty guns ranging in caliber from 105-mm to 210-mm. Highly perfected fire control centers permitted rapid transfer of massive concentrations. Thus they blocked the enemy's offensives or opened the way for counterattacks.

But tanks and planes were necessary everywhere, planes especially. German industry, already severly pounded by the Anglo-American bombers, was no longer able to satisfy the demands of the various fronts.

Pressed on every side, the High Command split up its large armored units, reducing the number of tanks to 150 in 1944, and to sixty in 1945. It was forced to increase the number of personnel serving antiaircraft weapons. But the Russians continued to dislodge the German army from one barrier after another.

Already masters of the skies, the Allied armies of the west methodically conquered the insular and peninsular domains of Italy. They landed in Normandy, then in Provence, breaching and overrunning the ramparts of the Atlantic and Mediterranean with their large air and mechanized units. Aided by the "resistance," which everywhere was engaged in sabotage and guerrilla activities, they quickly freed the French territory.

It was evident that Germany was lost. She had but one chance left. She might yet be able to discover new secret weapons whose employment would again revolutionize the forms of war. Her scientists never slacked their efforts. The V-1 and V-2 appeared, combining the possibilities of the aerial arm with the chemistry of explosives.

But to a greater degree than ever before, Allied aviation was the undisputed master of the German skies. Day and night it destroyed her railway lines, bridges, and factories, nipping in the bud the possibilities of the new weapons. It was in vain that the Germans burrowed into their mountains and constructed subterranean factories. The mechanized tide irresistibly overflowed their territory, all of which was subjected to the action of Allied aviation. Germany had lost in the motorized war.

Surprise, speed, and mass, put into action under the direction of superior cadres, bring victory. As long as these factors were in Germany's favor, she knew but one rule—

offensive action, and one result—victory. But, blitzkrieg demands blitz victory; total warfare demands total, decisive, and brutal victory. Fortunately for western civilization, Germany had time to gain but partial victories.

The German war machine was slowed down, then stopped completely, giving time for assembling a mass of personnel and matériel, time to awaken the desire for liberty of the nations affected, time for leaders and armies to adapt themselves to the new forms of warfare. The German army, against its will, was obliged to adapt its resources to methods of defensive action—the weapon of the weak. Above all, it lost its mastery of the skies, an essential condition of victory. From then on, time worked against it, finally refusing it the one last chance of a new formula of war.

How Fast Can We Fly

Digested at the Command and Staff College from an article in "Royal Indian Air Force Journal" (Great Britain) April 1946.

. . . . . He did it probably just from exuberance of spirit; a high-speed dive is a wonderful sensation. He was at 30,000 feet in his fighter, doing some 350 miles per hour. So he rolled over and pointed his nose at the ground and let her go. The speed built up: 400-450-500 miles per hour.

It took strong forward pressure on the stick to hold the aircraft in this dive. But he held her forward, and kept her diving. At 25,000 feet, approaching 525 miles per hour he crossed the frontier from the known to the unknown.

The plane shuddered, bucked once or twice, and all of a sudden became willing to dive. The nose pitched down to a steeper angle, and at the same time the sound and tempo of the plane's motion through the air changed completely.

Startled, he came back on the stick. But the plane did not answer. It seemed as if the controls had somehow become locked. The plunge continued: 15,000 feet. He hauled back on the stick with all the strength of desperation. In a steep dive, at almost ten miles a minute, it takes only a few seconds to get from 15,000 feet to the ground.

People on the ground heard an unearthly sound, as from a siren, and saw the plane go into the earth like a bolt of lightning.

This sort of runaway dive has been reported ofted in recent years. Always the story is essentially the same: a plane in a dive reaches a speed of approximately three-quarters the speed of sound, and goes berserk.

Not every dive goes all the way into the ground. Sometimes the plane recovers at low altitude—suddenly, and for no reason explainable by ordinary piloting experience. The real meaning of these troubles—called by the loose name "compressibility"—is important: we are now coming up against an upper limit to speed in the air.

There has, of course, always been some upper limit to flying speed, but this one is different; more nearly absolute. In the past, if we could not fly faster than we did, it was because our engines and propellers were not powerful enough to pull us faster against the enormous air resistance of high-speed flight; if we could not dive faster than we did, it was because our wings were not stiff enough, and would flutter at excessive speeds.

The new speed limit is not imposed by any sort of feebleness of the plane, but by the very nature of the air. All those old speed limits have been eliminated; we have learned to evade them somehow; or to pull through them.

But we dare not use the speeds which are potentially at our command, for at a speed three-fourths that of sound, the plane goes out of control. No one has ever held a modern fighter in a steep dive long enough to

let it reach all the speed it could reach; at least no one has lived to tell about it.

What makes the compressibility problem even more acute is that at high altitude, where planes tend to fly faster, the speed of sound is lower, because the air is colder. At 35,000 feet, three-fourths of the speed of sound is only 500 miles per hour. Thus the new speed limit is no longer a dive problem only. As planes fly higher and faster, even transport types will approach this limit; and thus there develops the absurd condition that the pilot has to hold back his aircraft in level flight lest it shudder and buck and fall out of the sky. That is the new frontier of flying. Strangely enough, flights at speeds faster than sound may not prove so difficult. But it is speeds just below the speed of sound that we can't manage. And you can't fly at 1000 miles per hour without first flying, at least for a moment, at 600; neither can you slow up again without going through that critical speed range. It is safe to say that no aircraft has yet traveled much faster than eight-tenths the speed of sound—and survived.

Bullets—yes; any infantry bullet travels faster than sound. To a bullet or a rocket the air is merely a nuisance. Both can push their way through air at any speed, simply by brute force. But a plane makes use of the air. It holds itself up by washing the air down with its wings. It pushes itself forward by kicking the air back with its propeller or its jet device. And here is the problem: as the speed of flight approaches the speed of sound, the familiar pattern of action and reaction between the aircraft and the air first suffers a gradual change and then, all of a sudden, breaks down.

What has the speed of sound to do with the speed of flight? "Speed of sound" is merely a short expression for "speed at which pressure waves travel through the air." And here is the connection: When a plane flies, its wing blows up the air all around it into a complicated pattern of up-flows, cross-flows and down-flows, slow currents and fast ones, pressures and suctions.

This lift-making pattern extends well ahead of the aircraft; the pressures and suctions prevailing on the wing itself send faint but distinct pressures and suctions far forward so that the air "feels" the wing's approach and begins to flow into the pattern long before the wing itself actually arrives.

This runahead of pressures and suctions in front of the flying plane takes place at the same speed at which sound explosion-blasts travel: 760 miles per hour in average sea-level air.

If the plane is a fighter, traveling at 450 miles per hour the runahead is by comparison quite slow; pressures and suctions still extend ahead of the plane, but only just barely. And if a plane should actually fly faster than sound, it would not only outrun its own noise, but would equally outrun its own advance pressures and suctions. Its wings would thus continually smash into air completely unprepared for its impact. A radically different pattern of airflow would result, and therefore, entirely different forces.

Compressibility has reared its ugly head several times in recent years, each time with a different face, each time threatening to stop the pursuit of higher flying speeds.

It showed up first as propeller trouble. A propeller blade is essentially the same device as a wing—except that it makes a forward pull rather than an upward pull.

The characteristic snarl of an airliner on a take-off—a sound like the tearing of silk magnified ten thousand times—is just this: the tips of the propeller blades reach the speed of sound. This makes the tips useless for propulsion.

A dive bomber or a fighter in a dive makes the same snarling sound for the same reason. But in this instance it isn't that the propeller turns so fast; the plane's own speed is so high that, added to the rotational speed of the propeller, it gives the propeller tips "supersonic" speeds, making them useless. In a dive this does not matter, because the plane is pulled by gravity, not by its engine. But it shows that there is a

limit to the flying speeds at which propellers can actually exert a pull.

This particular speed limit lies at about 475 miles per hour. Until jet and rocket propulsions came along it was, of course, also the absolute speed limit for planes in level flight. That is why the jets are so important: in abolishing the propeller, they circumvent compressibility's first attempt to limit our flying speeds.

But meanwhile compressibility had already showed up in a different form: on the aircraft itself. As flying speeds went from 200 miles per hour to 300 and beyond, it became increasingly evident that the drag of aircraft was higher than it should have been. High drags required high power—more power than it was practical to build into a plane. That this was the result of compression and expansion of air could be seen with the naked eye, especially in high-speed maneuvers such as pull-outs from dives. Sometimes, when you glanced out at your wing, you found its top surface covered with a sheet of white fog: the expansion of air there was so sharp that it cooled the air enough to make it foggy! Obviously, then, new wing shapes for planes had to be developed which would maintain the correct lifting pattern of airflow despite the tendency of the air to swell or shrink. Designers went to work, and came up with such designs as the Davis wing of the Liberator and the so-called laminar-flow wing of the Mustang.

With these low-drag wings, pilots could for the first time reach speeds seriously approaching the speed of sound—at least in dives, and later, with jet propulsion, in level flight. It was then that they discovered —and some of them paid for the discovery with their lives—that compressibility has interposed yet another speed limit: as the speed exceeds about three-quarters of the speed of sound—the plane goes into an uncontrollable dive.

As all this research is translated into new design, the airplane will certainly change considerably in appearance. The characteristic stream-lined shape will lose its meaning. Instead, planes will have long, sharply pointed noses. Extremely fast ones may eventually have blunt, cut-off tails—like bullets. Wings will become extremely thin—as thin as they can be made and still contain the necessary structure to keep them stiff.

Soon some daring pilot will push through the shock wave trouble and regain control on "the other side" at speeds faster than sound. And thus will open an era of speeds as yet unimaginable.

What exactly is it that happens at three-quarters of the speed of sound? The air which flows over the curved top of the wing is speeded up. This speeding-up of the air is a necessary part of the life-making action. Without it there could be no suction and hence no lift. But it means, with a wing of average shape, that the airflow over this part of the wing begins to exceed the speed of sound even when the plane flies at less than the speed of sound.

This region of "super-sonic" flow then acts as a barrier to the runahead of pressures which is so important a part of influencing the air ahead of the wing. As a result, they pile up, forming a "shock wave" which stands still upon the wing.

This freakish shock wave breaks down the entire action of the wing. Once this happens, the wing loses much of its lift, and the plane wants to nose down. As a result, the plane "tucks under"—becomes uncontrollably nose-heavy and steepens its dive, and thereby picks up more speed. Eventually the plane becomes simply a bomb, and the flight curves down and down into a straight down plunge.

The shock wave problem is now under attack on a broad front. "Dive recovery flaps" have been tried, which are to force a plane out of a dive should it get sucked under.

The Importance of Cavalry in Our Army

Translated and digested at the Command and Staff College from a Spanish article by Captain Camilo González in "Memorial del Estado Mayor" (Republic of Colombia) March-April 1946.

WHEN motors came into wide use in military organizations, and mechanization was becoming general in all armies which regarded themselves as modern, many of the military profession believed that the cavalry had fulfilled its mission and was becoming a thing of the past. Actually, it has not been so, and we saw cavalry employed with great success in World War I, even after the appearance of tanks in the year 1917. In the Spanish War the role of the cavalry was a most outstanding one, then in Poland it performed tasks of the greatest importance and finally, in Russia the Cossacks demonstrated to the world the capabilities of a well-equipped and organized cavalry.

Of all military questions debated since the termination of World War I, none has been the subject of more study and controversy than that of the mission of cavalry in modern battle. It was practically agreed during the first three years of that war that cavalry was doomed to disappear, since its role in combat and the rapid and overwhelming decisions its employment produced were made impossible by the destructive action of automatic weapons. There were those who said that: "A part of the classic functions of cavalry will fall to the air forces; and another to the squadrons of tanks." The majority of the regiments of the French Army, for example, were dismounted, the troopers converted into infantrymen, and their officers placed in command of infantry formations. One of the Verdun forts was commanded for several months by a cavalry officer. Nevertheless, it is to be observed that the French General Staff did not proceed to disband all cavalry units as the war continued, but, on the contrary, maintained several of the very powerful ones at the disposal of the high command.

The Spanish War served as a testing ground for all arms, and especially for the cavalry. The first appearance in the Spanish War of considerable elements of this arm was in the hills and planes of the Jarama river valley, where a few squadrons were the first forces to reach the enemy bank and dominated the entire Jarama salient. That event began a demonstration of the ability of the cavalry to fulfill missions of great importance. In the battle of Alfambra the results achieved by the cavalry were magnificent. It was here that by means of a surprise charge, and in less than a half hour, all the enemy positions were taken, causing confusion and capturing the greatest number of prisoners recorded in any single battle of the entire Spanish War. The tactical surprise produced by the employment of cavalry had been complete. So many successes were obtained with this arm, that from five squadrons at the beginning of the war, the number was increased to more than fifty by the time the war had ended.

Poland, when invaded by Germany, had forty regiments of cavalry, which indicates the importance which had been attached to this arm, but this cavalry, armed only with carbines and lances, was powerless to oppose the German armored divisions effectively, in spite of its courage. This shows us that the important thing is, not to have a large force of cavalry, but to have one which is well equipped. If the Polish cavalry had been equipped with modern weapons, its resistance to the enemy would have been considerable.

In Russia we have seen that the spring thaws turn the roads into a sea of mud, making them impassable for vehicles. This makes the large-scale employment of cavalry imperative on this front, and the great success that attended its use is well known.

The Germans in the recent war, not only employed cavalry in its characteristic missions, but assigned another mission to it, consisting of the following:

After the armored units had broken the enemy positions and opened a breach in depth, there remained small centers of enemy resistance which it was impossible to annihilate because the speed of the attack did not permit the diversion of tanks for action against objectives other than the assigned one. Cavalry units were therefore sent into action and rapidly cleared the terrain of all enemy forces which remained, and opened the way for operations of the other arms.

If cavalry has been of such great importance in Europe where most nations produce their own motors, where highways cross the country in every direction, and where the terrain is not so difficult to negotiate, that is, where the possibility at employment of mechanized forces is almost unlimited, what may we expect in these countries that are so poor and which are obliged to import not only their motors but even the smallest replacements? Their degree of industrialization is far from being able to provide us with the necessary elements for the mechanization of our troops, possible theaters of operation are many, and manpower extremely scanty. There are only second-class roads, and their number is extremely small in comparison with the extent of the country, and the terrain renders even the movements of infantry forces difficult at times. We must then be convinced of the fact that the mechanization of our forces cannot be justified. Their motorization, however, is indispensable, especially in some regions of the country where the road-net is better.

There remains then, sufficient evidence of the need for a well-equipped and organized horse cavalry in our army, capable of efficiently meeting the demands which are made upon it. It would be foolish to think at present, or for a long time hence, of the mechanization of this arm in our case, but this without denying that experimentation along this line can be started.

The cavalry arm being of such importance, it is necessary that we do everything to equip and organize it in the best possible manner, so that it may produce the results which circumstances demand of it.

Morale

Digested at the Command and Staff College from an article by Brigadier E. H. A. J. O'Donnell in "Journal of the Royal United Service Institution" (Great Britain) February 1945.

I should like to be able to start with a short comprehensive definition of morale which would be universally acceptable. Unfortunately, it is far more difficult to do this than one might imagine. We all know what we mean when we talk of morale, but the trouble is that we do not all mean the same thing. To some people the word denotes supreme courage and fighting qualities in the face of the enemy—and no more than that. To others, the word conjures up visions of woolen comforts and cups of tea. Others, again, regard morale as being synonymous with good discipline.

All these definitions contain part of the truth, but none contains the whole truth. It may be that the general haziness about morale is due, in part, to our using a French word instead of an English one. However that may be, the fact remains that morale is the word generally used, and I suppose we must now try to make the best of it.

Components of Morale

As I see it, morale is a combination of qualities of the mind, of the spirit and—to a lesser extent—of the body. Morale is an attribute of mankind all over the world, but it takes different forms in different countries. There is the morale of the totalitarian state where the individuals are regarded merely as minute parts of the state mechanism and of no importance whatsoever except in so far

as they serve the interests of the state. As one would expect, morale in such countries is of the mass-produced type. It is produced in terms of quantity rather than quality and it is not built to last. It can be, and is, very formidable, but it obviously depends for its maintenance on a continued belief and confidence in the state regime. It is the morale of the herd, rather than of the individual; and if the leaders of the herd fail, collapse of the national morale must follow swiftly.

We also have the type of morale shown by the individual citizen of a free country where each man is different in some degree from his fellow and where national morale represents to aggregate of the morale of individuals. There is an element of the spiritual about it, but nothing mystical. It is grounded not on mass illusion, propaganda or the herd instinct, but on the faith of the individual citizens in their cause, their leaders, and themselves.

I would say, therefore, that the principal component of morale is *confidence*.

The first requisite is that the fighting man should know what he is fighting for and should accept that cause as a just one. No doubt, there was a time fighting men were just so many unthinking physical bodies who only asked to be given weapons, food, and a right to loot. That day is far behind us. The democratic citizen of today is generally an intelligent and reasonably well educated man who wants to know something about the rights and wrongs of the dispute to which he is asked to devote perhaps his life, and certainly years of discomfort and dislocation. He is no longer content to be actuated by slogans—he requires a sense of purpose. He does not want to examine all the details and niceties of the diplomatic negotiations which preceded the outbreak of war. All he wishes to know is that the basic principles involved in the dispute are such that his country cannot with honor avoid going to war, and that he is on the side of decency.

Given confidence in his cause, the fighting man naturally wishes to be assured that his government is one which will play fair by him and his dependents and is one which he is perfectly free to criticize to his heart's content.

Next, it is absolutely essential that he should have confidence in his military leaders. It is even more important that he should trust his own officers and NCOs, than that he should like them. If he does both, so much the better, but it is absolutely vital that he should trust them. No officer can regard himself as efficient if he does not have the confidence of his subordinates. This feeling of trust, however, does not arise spontaneously. It calls for very active and continuous effort on the part of the officer. First, the officer must know his own job from A to Z; second, he must know and trust his men completely; third, he must be keenly interested in his men and in his job; he must treat them as human beings, each with his own individual characteristics, and not as so many robots.

Last, and most important of all, is the necessity for *self-confidence*. This is dependent on many factors. In the first place, the morale of the fighting man cannot be at its highest pitch unless he knows his job, is fit to do it, and has the right tools to do it with. In order that he may know his job it follows that his training must be of the best.

To attain its object, training must consist of intelligent teaching which arouses and sustains the men's interest. Training should never deteriorate into routine repetition and drudgery merely for the sake of "filling in time" and "keeping the men occupied and out of mischief." The object of training is not to turn a man into an unthinking automaton. I suggest, therefore, that it is just as important to tell the recruit why he has to do things as it is to tell him how to do them. The age of "Their's not to reason why, their's but to do or die" is finished. A fighting man who knows the job, *and why the job is necessary*, is worth twice the man who just knows how to do it but is left to wonder what is the use of it all.

Next, the soldier must be fit to do the job

allotted to him. I do not mean by this that unless a man is blessed with magnificent physique and stamina he cannot have high morale. Nothing is further from the truth and it is fortunate that this is so, since a large proportion of the men called to the fighting forces during the war are of necessity of the lower medical categories. But there is no reason why a man of limited physical capacity should not have as high morale as anybody else, provided that he is not given a job to do which is beyond the limits of his physical capacity. This leads me, therefore, to mention the supreme importance of getting the right peg into the right hole. Nothing is more destructive of morale than for a man to be given a job for which he is neither physically nor mentally suited.

Having trained the soldier well and put him into his correct niche, it is then very necessary that he should have confidence in his weapons and equipment. The importance of this is manifest, but none-the-less I regard it as of less importance than the confidence of the soldier in himself and in his leaders. Well led troops with inferior equipment will every time beat well equipped troops who are badly led. But it goes without saying that our fighting men have a right to expect the best tools obtainable for the job and that these factors undoubtedly increase that vital element of self-confidence which is so essential.

Aids to Morale

I have ventured on a somewhat cursory analysis of what I believe to be the basic ingredients of morale, namely, confidence of the fighting man in his cause, his leaders, and, above all, in himself. I have confined my remarks to those fundamental matters which are necessary for the *creation* of morale. Such things as a good cheap mail service; up-to-date newspapers and books; good and cheap canteens; bathing and laundry facilities; leave hotels; entertainment; legal advise bureaus, and many others which will occur to you, are invaluable *aids;* but they do not, of themselves, *create* high morale. A unit may be provided with excellent canteens and baths and shows, etc., but if there is no trust and mutual respect between the officers and men, morale will be low and will remain so.

Morale tends to be overlooked in some quarters because of a misguided belief that it is somebody else's job to look after it. Many people seem to think that it is a matter, purely and simply, for the welfare services. Others think that if the morale of a unit is bad it is only a question of discipline gone wrong. Surely, all this is dangerous rubbish! In fact, the maintenance of morale is *everybody's* job, and perhaps that is the reason why it sometimes comes to be regarded as nobody's job. It is a matter for the careful consideration and *action* of all branches of the staff. Above all, it is a matter for the commander and the regimental officers.

Behind the Line

There is just one other fallacy about morale with which I should like to deal. That is the idea that it is only really important in connection with the fighting troops and then only when they are in action. Clearly, it is quite essential that the morale of the soldier, when in battle, should be at its highest pitch. Nobody would dispute that. But it would be a grave error to suppose that it is *only* in actual battle that morale matters. No matter how good the morale of the fighting unit may be, the battle will be lost if the administration troops, who are responsible for supporting the men in battle with supplies, etc., fall down on their part of the job. And if their morale is low, they will let down the men in front.

Moreover, while success in battle is the finest stimulus, it must be remembered that high morale is even more vital in times of difficulty and defeat than when everything is going well. It was morale which caused Dunkirk to be a triumphant withdrawal instead of a disorderly and fatal rout. Not even the gallantry of the few in the Battle of Britain could have availed, if it had not been that the morale of the whole country was

magnificent—in fact "Churchillian" in its power and strength.

We must remember, too, that in these days of mechanized warfare nearly half the troops in a theater of war seldom, if ever, even see the enemy, much as they would like to. Their jobs are very important, but lack all the excitement and adventure. Therefore we arrive at the conclusion that although morale is vital to the front line it is, in some respects, easier to maintain there than in the rearward areas where men are more liable to rust from monotony and boredom. Transit camps and such places, where there is a large floating population with nothing particular to do, are the most difficult spots in which to sustain morale.

Personally, I hope the day will come when it will be the full-time job of an officer in every formation to be responsible for watching and coordinating all the measures which are necessary to induce and maintain a high state of morale. It has always been a matter of surprise to me that we afford specialists in a thousand other subjects, but none for this. I should have thought that the importance of morale is such that it calls for the full-time study of specially selected officers.

Factors Which Raise or Lower Morale

Let us consider now some of the ways in which morale can be stimulated and also some of the factors which tend to depress it. I have been trying to emphasize the paramount need for the soldier to have confidence. Perhaps we have been looking at the man so far primarily as a soldier, rather than as a citizen. It is easy to overlook the fact that between eighty and ninety per cent of our fighting forces today are really citizens in uniform and not professional soldiers. Although they have proved to be magnificent soldiers in the time of need, we must remember that soldiering is not the "be all and end all" of their lives as it is in the case of the professional regular army. The citizen soldier's ambitions and interests must still remain focused ultimately on his future as a civilian, on his business, and on his home. After all, it is for the preservation of these things that he is fighting. Therefore it can never suffice for an officer to look upon his men just as so many soldiers who have no anxieties and no thoughts apart from soldiering.

It is a most important element in begetting the confidence of the soldier in his officer that the latter should make it plain that although the last thing he wishes to do is to pry into the private affairs of his men, he is nevertheless always there to act as a friendly adviser. It may well be that nobody can provide a ready solution to all his difficulties but, even if this is so, it will make all the difference to the soldier if he knows that he can turn to his officer, if only as a sympathetic listener. In the majority of cases, however, the officer can do much more than just offer sympathy. He can offer useful advise either from his own resources or by discussing the case with older officers or the doctor or the chaplain. There are also the many fine voluntary organizations which concern themselves with the welfare of the soldier and which are ready and eager to do everything that can be done to ease his burden. In a good unit every man should feel that the first person to whom he can naturally turn for assistance in his troubles, whatever they may be, is his own officer.

I would class anxiety as enemy number one of morale. It saps the soldier's self-confidence and distracts his attention from the job in hand. It may be anxiety about his job in the army, anxiety about his family, or anxiety about his future. Whichever form it may take, it is up to the officer to see what he can do to help.

I would put boredom as a close second. You can imagine the difficulties of sustaining morale among men who have a monotonous, dreary job to do, day in and day out, in some remote and probably uncomfortable place. This is where the good officer can show his worth. The men must be given a sense of purpose. They cannot be told too often how necessary their job is. They must be encouraged. Entertainment is hard to come by in such places. It is all the more important to procure the best that can be provided or,

better still, extemporized among the men themselves. Local talent should be used to the full. Every effort must be made to combat monotony. As far as possible, men on routine work should be "turned over" constantly. Avoid stagnation of the mind as you would the devil.

Importance of Morale

Now let me say a word or two about the importance of morale. It is almost incredible, but unfortunately true, that only too many people content themselves by just paying lip service to it. I cannot help remembering three conversations I had during the war. I was told one night at dinner by one of our younger statesmen that "nothing mattered" in comparison with the supply of bombers. A distinguished Lieutenant General plainly regarded me as a lunatic because I found myself unable to agree that the only real requirement for victory was a sufficiency of armor. Another very eminent soldier assured me that success depended on an adequate supply of airborne troops—provided we could count on that we need not worry about anything else! I don't want to be unfair to any of these distinguished gentlemen, and I am quite sure they cannot have meant to be taken literally, because it is manifest rubbish to think that victory can be secured in any war solely through the instrumentality of one particular arm or weapon. *The most important and vital weapons in the hands of any country at war is its fighting man.* Perhaps the day will come—sooner than we think—when we shall live in deep caves and wage war on each other by pressing buttons and emitting rays and robot bombs. But that day has not come yet; and even if it does come, the morale of the people at the "receiving" end of the bombs will still be the determining factor as to who can last out longest.

Too often, it is suggested that considerations of morale must give way to operational considerations. I am afraid I have failed dismally to make my point unless I have shown that morale *is* an operational consideration and one of the very first rank. Nobody doubts that the supply of guns and ammunition has very definite operational significance. Until the day arrives when we can hypnotize our enemy into impotence instead of blasting him into eternity with steel, presumably guns and ammunition will retain their operational importance. To be of use, the guns must be kept in the best possible trim. Is it less important that the men who man the guns should be kept in the best possible trim? Does it really make for success in battle to have first class equipment, but disgruntled men? I think a moment's thought must satisfy everyone that morale is, always has been, and always will be a matter of supreme operational importance.

I quote from one of the greatest leaders of this or, I venture to think, of any other war—Field Marshal Montgomery. In some notes which he issued to the 21st Army Group the Field Marshal said:—

"A high morale is a pearl of great price. The more I see of fighting, the more I am convinced that the big thing in war is morale; it is probably the most important single factor."

Naval Guns in Ground Operations

Translated and digested at the Command and Staff College from a Russian article by Colonel-General G. Odintsov in "Krasnaia Zvezda" (U.S.S.R.) 27 April 1946.

World War II produced several excellent examples of coordinated action between ground and naval forces in both defensive and offensive operations. Such operations were often sporadic but at times, as was the case in the Baltic area and at Leningrad, were very successful.

Joint operations of the Leningrad Artillery

and of the Baltic Fleet began during the first weeks of the war when stubborn defensive battles were fought along the coast of the Baltic, and became especially effective during the defense of Leningrad and Kronstadt.

When German troops were advancing toward Leningrad, the entire defensive front began bristling with numerous artillery installations. The big guns of fleet units, forts, coast artillery, and special naval battalions manning guns taken from the ships, all took active part in the preparations for the impending assault on the city.

On the approaches to Leningrad, German tanks and motorized infantry units were met with massed fires of the ground artillery, battleships, cruisers, destroyers, and guns mounted on special railroad platforms.

The guns of the Baltic Fleet played an important part in repelling the German attack on Leningrad, but the first period of this naval action had certain weaknesses. For example, not all ground artillery officers knew how to employ the naval artillery correctly. Many officers did not know that the life span of the naval gun is limited and they often assigned missions to 305-mm guns which should have been given to pieces of much smaller caliber. Naval artillery officers at that time had not learned the technique of cooperation with ground troops. At first they did not understand the necessity for subordination to ground commanders. It is interesting to recall that during the first months of the war some of the observation posts of the naval artillery were manned by noncommissioned officers, while officers were stationed at the firing positions, and that the favored method of firing was area fire by salvos, which often resulted in inefficient utilization of naval artillery.

All these defects were gradually eliminated however, and by the beginning of 1942 all the combined forces were concentrated under one commander. Thus there was achieved a complete centralization of control of all the artillery defending Leningrad. It became possible to mass the fires of all types of naval artillery on a front of over thirty kilometers in length.

When the Germans had closed the ring of encirclement around Leningrad and had begun the shelling of the city, the artillery of the ground forces and the navy were given the mission of protecting the city from German artillery fire. At first, the naval artillerymen, not possessing the equipment for reconnaissance, were unable to engage enemy batteries; our naval gunners did not know much about aerial photography, artillery planes, and aerial artillery observers.

But the navy soon developed its own reconnaissance personnel and equipment, and quickly became most efficient in supporting the fires of the heavy ground artillery. In counterbattery missions, the fire of several naval guns against special German artillery units assigned to destroy Leningrad was especially effective. These guns had great range and tremendous destructive power, and were exceptionally effective in the suppression of the deeply echeloned hostile artillery positions. Heavy railroad guns were also effective in counterbattery missions. They were highly mobile and maneuverable. They often approached the enemy at night, to within about two kilometers, fired several concentrations suddenly, and then returned to their main positions without any loss of personnel or expensive matériel.

The organization of the cooperation between ground and naval artillery in offensive operations was most interesting. The naval artillery quickly learned the methods of firing on ground targets and efficiently complied with a variety of missions assigned by ground commanders.

Naval artillery cooperated with ground units (down to the division) forming, in each offensive operation, a separate naval group. Its fires were used primarily to reinforce the ground artillery in counterbattery and general support missions. In accordance with this, the naval artillery group was divided into a number of sub-groups: railroad mobile, surface vessels, fort and coast artillery subgroups. These groups were directly under naval command. Having received a plan of action, the artillery commander of the Baltic

Fleet assigned missions to the various sub-groups.

Commanders of naval sub-groups, and naval battalions, had their own observation posts organized and functioning in the same manner as those of the ground artillery. Communicating with the firing positions and battleships were carried out by telephone and radio. As a result, there were never any interruptions in communications which could have impeded the accomplishment of missions.

The Baltic naval artillery participated in the breakthrough of the German blockade near Lake Ladoga in the rout of the enemy on the Karelian Isthmus, and in the storming of Biborg in the summer of 1944. The naval artillery suppressed hostile batteries, shelled enemy headquarters, railroad centers, warehouses, and airfields, and destroyed the most formidable fortifications built by the enemy.

During the period of the advance of our troops following the end of the German blockade, a powerful German artillery unit delayed their movement. Most of the observation posts of this group (about twenty of them) were located on one of the large hills east of Krasnoie Selo. Here the Germans had constructed very durable shelters. The destruction of these observation posts was entrusted to one of the sub-groups of the naval artillery.

With the beginning of the general artillery preparation, heavy naval guns (305-mm) began firing upon the hill. In spite of unfavorable weather conditions, the results were excellent. The most important observation center was put out of action during the most critical hours of the battle. When the hill was reached by our infantry, they discovered that the German observation posts and shelters had been completely destroyed.

Another sub-group, together with ground artillerymen, took under fire the firing positions of the Germans, and the farthest and most powerful artillery installation was put out of action by the combined efforts of our ground and naval gunners.

The artillery of Kronstadt and of its forts also participated in this operation. It shelled the objectives on the flanks and in the rear of the enemy. It is in interesting to note that even the guns of the Naval Research Station took part in this operation, firing upon the enemy with their very heavy projectiles.

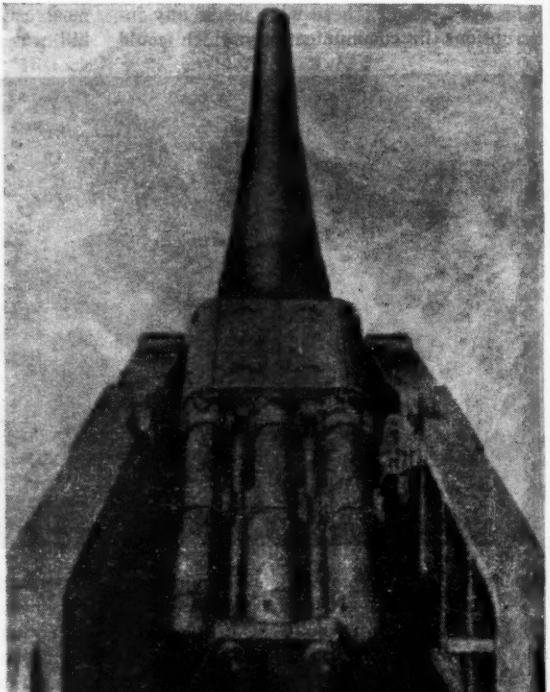
Naval artillery was very effectively utilized in the Viborg operation in the summer of 1944. Naval guns comprised thirteen per cent of the entire heavy artillery, and the

naval group included railroad artillery, fort artillery, naval surface vessels, and the ships of the Naval Research Station. The commander of the group was ordered to destroy a number of weapon emplacements and fortifications in the depth of the enemy's defense zone and those located on the north coast of the Finnish Gulf. This included fifteen artillery batteries and a railroad gun operating on the coastal railroad. In addition to this, they were supposed to shell various Finnish headquarters, command and observation posts, communication centers, and to deny the enemy the use of the most important highways and railroads of the area.

The naval artillery established observation posts within the attack zones of the advancing ground troops and set up close liaison with all rifle units. Some of the observation posts were located on the rocks protruding from the water along the coast of the Gulf. This excellent location of the posts secured observation of all shore highways and helped considerably in the conduct of fires directed at coastal objectives. The destruction of coastal fortifications by naval gunfire over a stretch of some fifteen kilometers caused the enemy to expect an invasion of the coast-line, and he diverted some forces from the very sector where the ground forces made the main attack.

The action of naval artillery in the Viborg operation was characterized by great flexibility. It was achieved by the extensive maneuvering of not only surface vessels, but also of other types of naval artillery. The naval artillerymen, for example, noticed that the enemy had failed to destroy the railroad tracks because of our rapid advance. Naval railroad battalions were immediately sent forward and, moving on the heels of the retreating enemy, actively participated in the breakthrough of the main defense and in the battle for the city of Viborg.

Now that the war is over, we must train our naval personnel in firing upon all types of ground targets and especially in the detection and destruction of ground artillery batteries. All artillery personnel must also study our experience in the organization of cooperation between the army and navy and familiarize themselves with the knowledge and experience acquired by our armed forces.



16-inch Naval rifle on a Barbette Mount.

Some Major Lessons of the War

Digested at the Command and Staff College from an article by Colonel R. B. Pembroke, Coldstream Guards in "Journal of the Royal United Service Institution" (Great Britain) February 1945.

THE present seems a suitable moment to consider some of the major lessons which have been learned in the war. Many of the lessons learned are not new, they are the lessons of old wars which have had to be relearned. On the other hand we must remember that it has been said that the British Army always goes to war trained and equipped for the end of the previous one. There is a modicum of truth in it due, I think, to the British preference for slow evolution rather than revolution and also to failure to differentiate between what is true as a principle and what is true only in certain particular circumstances. For instance, many soldiers were all too prone to regard methods, equipment or organizations proved in the Western Desert as necessarily applicable to campaigns in other countries, and we shall have to be more careful not to be dogmatic about things which may only apply in the peculiar conditions of Italy.

Developments in the technique of war follow largely upon the discovery of means to overcome limitations of weapons or the human body. The Russians have shown how the apparent hindrances imposed by weather could be overcome or disregarded and gained considerable advantage thereby. They refused to accept the conventional dictates of the weather built up on practice, and thereby advanced the technique of war.

We shall fail to progress in peace time with tactical developments and the exploitation of lessons learned in this war unless we take note that there is a tendency among various arms to build up what one may call "vested interests." For instance, you may hear it said and accepted that armored cars can only be used in certain circumstances, that heavy bombers can only be used in certain circumstances, and these alleged limitations delay the advance of the technique of war until the arrival of someone who, in order to achieve a certain result, either disregards or overcomes these limitations. In northwest France the Allies achieved surprise by refusing to accept the limitations apparently imposed by lack of harbors and by developing other means of getting stores ashore in sufficient quantities for major operations. We must keep our minds flexible and view with suspicion any limitations which are the result of particular circumstances or mere practice.

One of the things which has been learned, or rather confirmed, is that good discipline is an essential foundation for the successful army. Before the war, discipline had become somewhat unfashionable because it had come to be thought of as a senseless form of Prussianism, out of place in the democratic world. But that attitude was surely based on a misunderstanding of the word.

On the more material side the lessons and advances are many. There are all the lessons from combined operations and the improvements in technique since the first landings at Guadalcanal and Dieppe in the autumn of 1942. There are the lessons of that controversial subject, the use of infantry and tanks. There are the developments in supply by air and airborne landings with the flexibility which they give. There are the developments in smoke and the converse, artificial illuminant, and there is what we have learned from the Germans about the counterattack. I am going to deal with four major subjects only: the power of the artillery, depth in the attack, the importance of superior mobility, and the air arm on the battlefield.

The Power of the Artillery

When times were bad with the Russians after the German invasion they had to cut their divisional artillery to the barest minimum of forty-eight guns. When production improved they formed artillery divisions rather than replace their divisional weapons and were therefore able to keep a large part of their artillery as a direct and vital in-

fluence on the battle by concentrating it at the decisive place. The Russians speak of the artillery "leading" the infantry on to their positions.

For our part we have made great strides in developing the concentrated power of the artillery. In the defense, centralized control of the guns has of itself at times defeated a major attack, as at Medenin on 6 March 1943. In the attack, it is important to note that it is centralized control which has given the additional power to the artillery in this war as compared with the last, and not the weight of shell, though it is true that the air-burst has made troops in trenches more vulnerable than they were.

As regards the effect of gun fire in the attack, the experience of the war is that, despite the air-burst, artillery fire neutralizes but does not destroy an enemy well dug in. Assuming that the infantry are right up to the barrage or timed concentrations, there must be a minimum interval of two minutes between the guns lifting and the arrival of the infantry on the objective, this interval often being more when the timing has gone wrong. It is during this interval that the main trouble occurs, and the enemy is sometimes able to man his weapons before our infantry arrive.

As a general point we must integrate as much as possible the major means of firepower—artillery, mortars and machine guns, particularly in defense; and we must be careful, if the infantry gun is introduced, that it does not lead us to make the same mistake as the Germans with their infantry guns, namely to forget the importance of concentration and centralized control of artillery.

Depth in the Attack

By 1939 the number of automatic weapons in a unit had greatly increased and, in addition, in the west, both sides had constructed powerful defenses along their frontiers. Yet carefully prepared defenses of great strength were repeatedly overcome. It seems worth while to consider how this has come about.

It seems clear that the great offensive successes of the war cannot be put down to any inherent failure of the deep defense zones, which have frequently been overcome, nor are they due to any increased power of the artillery, nor can the air arm alone have brought about these results. I suggest that the cause is the greater depth now possible in the attack.

In 1914-1918 the great attacks used to peter out before complete victory could be achieved. Foch was wont to use the analogy of the disappearing ripples after a stone has disturbed a pond. In April 1918, after the initial success of Ludendorf's second great offensive, Foch remained unmoved despite Haig's calls for reinforcements. When Foch was asked why he was so unworried, he drew on a piece of paper the frontage of the breakthrough. He then drew a series of curves to represent the lessening impulses of the advance until they stopped at a distance from the original front equal to the frontage of attack. This is in fact approximately where the offensive stopped, though the important thing to note is that there was no vital objective within the area captured and therefore the offensive was a failure. Does Foch's rule of thumb method of measuring the scope of offensives hold good today? It is true that the depth of penetration must hold some relation to the width of the initial breakthrough. Nevertheless it seems clear that Foch's axiom no longer holds good, the reason being the greater depth of attack now possible.

The means we have of getting the greater depth in the attack are these:

Increasing the amount of medium and heavy artillery, the use of armored formations, direct air support, airborne troops, underground armies (only possible when operating in friendly country overrun by the enemy), strategic bombing, economic warfare, and political warfare.

We have made great progress in the use of these weapons. We have not yet succeeded in integrating all these means of warfare, nor has it yet been fully appreciated that they should be directed to deepening the attack, that is directly assisting the actual

battle so far as possible, and that only secondly should they engage in projects which do not directly affect the campaign being waged on the ground.

The Importance of Superior Mobility

Great resources are of limited value without mobility. Superior mobility may be the most important single factor in the winning of a campaign, though not in the winning of a single battle.

In a combined operation the main difficulty is not so much the actual landing as the defender's superior mobility which enables him to concentrate before the landed troops are established ashore. In the Pacific this advantage to the defender is largely nullified by the poor means of commnication available. In Normandy the Allies achieved superior mobility by clogging that of the Germans through air power.

In their advances on the White Russian front in June-July 1944, the Russians appear to have gone across country in very wide enveloping movements, cutting off the Germans in the main points of resistance, which were naturally at focal points and along the main lines of communication. It is not clear how the Russians moved across country at such speed, but it is worth noting that their achievement owed a great deal to its boldness. In the ordinary way such a policy has its dangers. We have seen the danger of wide envelopment against a strong enemy who makes use of interior lines in the disaster which nearly occurred at the opening stages of the British offensive in the Western Desert in November 1941.

Perhaps the clearest example of the value gained by the Russians from superior mobility is their success in the winter campaigns in moving across snow and ice, and in their overcoming of mud in the autumn rains and spring thaws.

Victory goes to the side which "gets there fustest with the mostest."

The Air Arm on the Battlefield

After June 1940, and in 1941, we were a commonwealth with power dispersed throughout the world; and the difficulty, or rather impossibility, of deploying an army on the continent large enough to defeat a great European power was as real as it always has been in history. It could not be foreseen that Russia would enter the war on our side, nor could it have been said with certainty in the autumn of 1941 that she would be able to stay in it. It could not be foreseen that the United States would fight or that if they did they could develop their power in time to intervene. In these circumstances there is no question but that the right decision was made to plan an enormous strategic air force which alone offered a possibility of winning the war. The decision must be made as to whether a war is to be won in the air or on the ground and all resources devoted to the decisive sphere, though anything left over can be used for other long-term projects. In this war, however, our hands were forced in 1940.

One of the most notable features of the Russian campaign is their concentration of effort at the decisive point. The Red Army and Air Force is entirely devoted to winning the battle in hand. It is possible that one of the means by which they make these amazing advances across countries with poor communications is by the use of transport aircraft on a large scale for maintenance purposes. The Russians only indulge in strategic bombing when the fronts are quiet. This is of course to some extent because they have not the bombing force available, but the main reason may be that even with their enormous resources they feel they cannot afford to dissipate them to the extent of providing a large strategic bombing force.

Notes on Soviet Artillery in Berlin Operation

Translated and digested at the Command and Staff College from a Russian article by Colonel-General V. Kozakov in "Krasnaia Zvezda" (U.S.S.R.) 8 May 1946.

THE Berlin operation was characterized by a number of peculiarities in the tactical employment of Soviet artillery.

The offensive began from a few small bridgeheads on the western bank of the Oder. These bridgeheads were even smaller than those on the Vistula in the Warsaw-Lodz operation. The amount of artillery used in all attack zones was even greater than that used in the preceding campaigns. The artillery preparation and all support missions were carried out at night and, for the first time during the war, the battlefield was illuminated by special projectors.

The attack itself, was of the nature of a gnawing through numerous defensive lines, followed later by a very difficult type of street fighting which called for unusual methods of artillery support.

Numerous rivers, lakes, canals, commanding heights, large wooded areas, and villages, towns and cities with their stone structures enabled the enemy to offer stubborn resistance.

The German Command had taken all necessary measures to reinforce the troops on the approaches to Berlin. While on 1 March 1945, the enemy had seventy-four infantry battalions and 1,909 guns and mortars, on a front of 130 kilometers, by 14 April they had assembled sixty-seven battalions of infantry and 2,220 guns and mortars, on a front of only forty-four kilometers.

During the latter half of March, the artillery staff of the army group had begun the planning of the artillery mission for the assault on Berlin. In order to have 250 pieces per kilometer of front in the decisive direction it was necessary not only to regroup all available forces, even those in reserve, but also to reshuffle artillery units between the armies and within the armies.

The tremendous amount of artillery assembled for the offensive was sufficient to neutralize not only the first hostile position but also a considerable area in the tactical depth of the enemy's dispositions. The assault echelon was to move forward, preceded by a double barrage for two kilometers and by a single barrage for from two to four additional kilometers. Such barrages were necessary because of the peculiarities and great tactical depth of the German defense. As a whole, the artillery preparation was to be different from the preceding ones to which the enemy had been accustomed.

The enormous amount of artillery available made it possible to create the necessary density of fire within the short period of artillery preparation and with relatively small expenditure of ammunition per gun.

At 0500, 16 April 1945, the roar of the tremendous mass of artillery and mortars signalled the beginning of artillery preparation. At 0520, the dark sky was lit by several powerful vertical rays of projectors. This was the signal for the attack. The projectors over the entire front went on, blinding the enemy and illuminating the battlefield for our troops. The artillery began firing its barrages—for the first time during the war, under conditions of darkness. The effectiveness of the artillery fire was tremendous. The speed of our attack and the hurricane-like night artillery preparation bewildered the enemy. Even before dawn, the infantry had advanced two kilometers.

During the first day of the battle, the first line of defense was completely overcome. Fighting for numerous artificial and natural obstacles defended by the enemy, our troops advanced from three to seven kilometers. In some of the sectors the attack was even more successful. By 0800, 17 April, after a thirty-minute artillery preparation, our troops captured the main position of the Germans. By the end of the day, our troops

had advanced about sixteen kilometers and had widened the breakthrough to about 120 kilometers. In the center of the attack zone, the enemy's resistance was completely broken, and our mobile units were committed to battle. But there were no large open spaces in which to operate. Our tanks had to fight their way through more fortified lines to which the enemy continually added more troops.

The artillery faced a difficult problem. By firing concentrations upon intermediate positions and centers of resistance, it had to clear the way for the infantry and tanks, destroy hostile fire means and manpower, repel numerous counterattacks, and consolidate captured positions. During all this time, it was necessary to retain centralized control over part of the artillery for massed fires.

As a rule, every day began with strong artillery preparation and the action that followed resembled an independent operation. Our tanks and infantry, supported by massed artillery fire, captured one defensive line after another. At 1130, 20 April, an artillery battery of one of our Guard Brigades sent the first shell into the German capital.

Street fighting in the city, in which every block was adapted for defense, called for methods different from those employed in field warfare. The tactics of street fighting worked out in Stalingrad, and perfected in street fighting in several other large cities, were again used in the battle for Berlin.

Our assault groups were made up of sixty to seventy infantrymen and reinforced by one squad of engineers, two tanks or two self-propelled guns, one 203-mm howitzer, two 122-mm or 152-mm howitzers, two or four 76-mm guns of the division artillery, and four to six antitank guns or regimental howitzers. At first sight, these assault groups seemed to be overburdened with artillery, but it should be kept in mind that all these artillery pieces were not used at the same time, but depending upon the situation and the demand for one or another caliber.

The activities of assault groups at the beginning of each day were preceded by artillery fires. The army artillery group suppressed all reconnoitered artillery and mortar batteries, the corps and division groups laid concentrations upon the mass of buildings and blocks to a depth of 400 meters, while the artillery attached to the assault groups used direct firing methods and shelled only the buildings to be assaulted.

Each street along which these groups advanced were first swept by the fire of snipers and submachine gunners. The infantry, clearing one house after another, moved forward through back yards, breaches in walls, and through cellars. Direct-laying guns advanced through streets under enemy fire. Not infrequently, when only one side of the street was cleared, the advancing tanks were fired at from the other side of the street.

In the course of these engagements, new tactics were worked out. The following example is characteristic in this respect. One of our assault groups was pinned down before a house which had been converted by the enemy into a strongpoint. It was necessary to destroy the building, but the street was swept by the fire of the German machine guns and snipers. Two regimental howitzers were quickly rolled out into the street. They fired several rounds, and after a few shots smoke and dust filled the street. The enemy was temporarily blinded. With the help of this improvised smoke-screen, a 203-mm howitzer was rolled out into the street. When it was ready to fire, the regimental guns ceased fire and took shelter in one of the nearby alleys, and as soon as the dust thinned out, the howitzer quickly destroyed the building with a few well aimed shots.

The Work of a Corps Psychiatrist in the Italian Campaign

Digested at the Command and Staff College from an article by Major Dugmore Hunter, Royal Army Medical Corps, in the "Journal of the Royal Army Medical Corps" (Great Britain) March 1946.

Encountering the Problem

WHEN a psychiatrist was attached to each of the three British Corps invading Italy in September 1943, no one was quite sure what their functions would ultimately be. Not altogether unwisely, they were sent into the field to build up the job for themselves.

The first task was to check the evacuation to North Africa of minor psychiatric casualties from battle by providing treatment and disposal for most of them locally, thus avoiding secondary deterioration and curtailing the wastage of man power. Necessity gave birth to improvisation and, in the face of many obstacles, a forward psychiatric center accommodating fifty patients was opened at CCS (Casualty Clearing Station) level, precariously staffed by one or two borrowed nursing orderlies and a number of enthusiastic convalescents.

During this period the average stay of a patient in the center could not be more than four days owing to the inflow pressure caused by the bitter fighting on and north of the Volturno. None-the-less, the proportion of all types of casualties sent out of Italy was reduced to under ten per cent (including a small number of psychotics). Some thirty per cent were returned to combat duty with their original units and the remainder were re-allocated, by a somewhat rough-and-ready selection procedure, to less exacting employment on the line of communication.

Out-patients had to be seen and court-martial cases reported on; minor administrative wars had to be waged over questions of personnel, transportation, tentage, and equipment. But all the time, in the background loomed the greater problems: how to check the flow of patients at the source, how to create a wider understanding of the causes and mechanisms of psychiatric breakdown, how to come to grips with the basic factors which influence a man's capacity and will to fight; in fact, the whole positive side of a Corps psychiatrist's job.

It was necessary to go slowly at first, to allow time for people to get used to the presence of a psychiatrist in the Corps, and time for one's own greenness to wear off. But as more psychiatrists arrived in Italy the pressure of clinical work relaxed. It then became possible to visit infantry and other units, and to stay with some of them for a few days. These contacts with combat officers and men profoundly influenced the outlook of the writer on all problems of military psychiatry and, indeed, continue to do so.

Formulating Basic Concepts

The army psychiatrist must first know his army, for his patient is the army rather than the individual. Next, he must have a clear picture in his mind of what the ordinary soldier has to face and how he contrives to face it. Only when he has established his norms can he adequately assess the deviations from them.

Moreover, the present environment of the individual patient is in the army at war, and neither has past nor his future can be relevantly considered except in relation to this. Mentally, the psychiatrist, like every other soldier, finds himself in a new world with standards and values of its own.

Group Loyalties.—One must understand the framework of group loyalties in which the soldier works and fights, and outside of which he is a lesser and more self-centered man than ever he is within it. To consider the individual soldier as an isolate, entirely detached from the group, is to pave the way for erroneous theories and for unwise decisions. Every fighting unit evolves a structure of group loyalties peculiar to itself, conditioned by the nature of its task.

Divisional psychiatrists enjoy a great ad-

vantage in that they are appointed to a formation which remains a constant entity. The corps psychiatrist may be responsible for the mental health of two, three, or even five divisions, yet knows that they are liable to be switched from his corps to another at a moment's notice. This makes continuity impossible in a field where it is most essential to good work.

Concept of Mental Health.—Health may be defined as the capacity of an organism to function efficiently within its established environment. From the army's point of view, a soldier is mentally in perfect health when his mind, undisturbed by distracting internal conflicts or by irrelevant external stress (e.g. domestic disharmony), is concentrated on the job in hand, with a positive determination to see it through, contributing all he can to the success of the enterprise. Such a man has achieved perfect adjustment to his new environment, the army at war, and is thus able to function as a fighting soldier with complete efficiency.

Adjustment of the usually peaceable citizen to life in a fighting army is not always easily achieved. Anything tending to disturb this adjustment will correspondingly tend to disturb his mental health by creating emotional stresses which impede his efficiency. Morale is the corollary of mental health in the armed forces—it is the final expression of group integration and purpose.

Personal Adjustment and Unit Morale.—The actors which on the one hand promote and, on the other, disrupt the personal adjustment of the individual and the morale of the group within the army are almost innumerable.

The former include, in the individual, a good personality, secure against its own internal stresses; a well-socialized outlook, not overvaluing the self, and ready to endure hardship for the sake of others; a consciously held purpose in relation to the war, and a knowledge that he is valued by the group. In the unit as a whole they include good leadership, centering on an inspiring CO, who in time becomes a kind of "father-figure"; intelligently directed training leading to clearly foreseen ends; sound motivation and a knowledge, widespread among the men, of the unit's task in relation to neighboring formations; a feeling on the part of the men, fostered by efficient organization and good welfare, that their officers are concerned for their well-being.

Factors which influence individual adaptation adversely include home worries, separation from the group (through sickness, change of unit, etc.), wounding, unduly long service overseas—especially where these occur in a personality torn by deep internal stresses, poorly socialized or inadequately equipped to meet the changing demands of life in any sphere.

Adverse effects on unit morale may accrue from battle-weariness and hardship too prolonged; from the uncertainty bred by ignorance of what is going on; from unfulfilled promises and false rumors; from poor organization and leadership; from long periods of unrelieved idleness, in which frustrated aggressiveness is misdirected upon those around or turned inwards in self-destructive expression.

Many more examples could be cited. Where the corps psychiatrist discovers adverse factors at work which do not appear irremediable, he endeavors to persuade those concerned to appreciate the significance of these factors and do what they can to remove them.

Work in the Field

Duties.—The list of duties of a corps psychiatrist as specified by the War Office in February 1944, included the following functions:

To advise on all matters pertaining to mental health.

To advise on the psychiatric aspects of morale, discipline and training, and by lectures and informal discussions with officers (staff, regimental and medical) assist in the promotion of mental health and preventive psychiatry.

To visit medical units and regimental aid posts and advise on the management of psychiatric and psychosomatic problems.

To keep himself informed of changing psychiatric problems during training and fighting periods with a view to the development of the mental toughness essential in fighting troops.

When, in the early summer of 1944, the corps psychiatrist was relieved of direct responsibility for routine clinical work, he was able for the first time to concentrate on the prophylactic side.

Visits to Units.—Visits to combat units are made for dual purpose of gathering and distributing informating. The psychiatrist's first contact is with the regimental medical officer, but when the opportunity is favorable he welcomes a chance of meeting the commanding officer and other officers. If the incidence of psychiatric casualties is lower than the average he will be interested to find out why this is so. If it is high he will seek possible explanations. These may lie in, for example, the exceptional conditions encountered, the loss of trusted leaders, or an unduly long period of continuous action.

The regimental medical officer may have problems of his own to bring up. The question, and when should an unduly anxious man be considered ill enough to go to the psychiatric center, is a perennial one with many aspects. Units are encouraged to handle their own minor psychiatric problems as long as they are able and willing to do so. The fate and progress of men returned to units from the Psychiatric Center is of interest, and in the long run may have a direct influence on disposal policy. Queries may arise regarding the use of drugs. But the commonest question of all, on the lips of both medical and combat officers, begins, "What would you do with a man like this . . . ?"

Discussion on more general problems relating to the minds of men at war tends to arise spontaneously in the evening hours. For this reason, one overnight visit is worth three at midday. Provided the psychiatrist is prepared to fend for himself, a visit paid while the unit is active is rarely unwelcome, and may be appreciated more than one when the unit is at rest. Indeed, the best way to learn an infantryman's background is to try doing his job for a few days.

Lectures and Conferences.—Conferences are held from time to time with, for example, the officers of a resting brigade. The corps psychiatrist usually opens with a talk dealing, perhaps, with the management of men who appear liable to break down in battle or some other subject directly related to the everyday work of the company or platoon commander. The discussions aroused are often long and eager, ranging over a wide variety of topics, and the psychiatrist usually goes away feeling that he has learned as much as he has imparted.

While it is the company or platoon commander who, by his control of the daily lives of his men, governs most directly their mental health, the influence of the regimental medical officer remains extremely important in prevention, no less than in treatment. Medical officers are therefore encouraged to recognize the simpler psychological mechanisms under-lying the reactions of members of their units and to study and practice "minor psychiatry."

Meetings and discussions with other specialists and with the administrative staff of the R.A.M.C. (Royal Army Medical Corps) are also desirable to stimulate an informal interest in psychiatric problems.

A periodic interchange of ideas with American and Canadian psychiatrists working in Italy has had valuable results for both sides, and it is profoundly to be hoped that this fruitful scientific liaison will continue after the war.

Advisory Functions.—Psychiatric advise has from time to time been sought or spontaneously offered on a great variety of special problems. Of these, absence without leave, the optimum use of rest periods, rehabilitation training, and post-hostilities planning are examples. There are indeed few problems involving human beings which have not some psychological aspect.

Conclusions

The Corps psychiatrist, in addition to

supervising the management of psychiatric casualties, has many other functions designed to reduce the incidence of breakdown and to maintain the morale and efficiency of the troops. His usefulness varies directly with his own capacity to adapt, his willingness to learn and the extent to which he can identify himself with the basic aim of an army at war. It also depends on his ability to get on with combat officers and men and to offer technical advice under the guise of "plain common sense" (or, sometimes, plain common sense under the guise of technical advice!).

While making full use of his professional training, he must keep both feet firmly planted in the real situation, which is the army as he finds it. He must indeed feel himself to be genuinely part of that army and not an outsider looking on.

In military matters, the professional soldier is supreme because, in the highest grades at least, his professional knowledge and skill are second to none. It is part of the job of the army psychiatrist to interpret for him his attitudes and trends of thought which may affect the morale and fighting efficiency of his men.

Super-Heavy Artillery

Digested at the Command and Staff College from an article by Lieutenant Colonel S. M. Cleeve, Royal Artillery, in "The Journal of the Royal Artillery" (Great Britain) April 1946.

THE debut of the atomic bomb was as sudden as it was startling. Immediately, there was a revolution in thought, the first reaction being the suggestion that normal army weapons are now outdated.

The saner view seems to be that for many years the atomic bomb will remain an accessory and not a substitute. If it substitutes HE then its approach into the army sphere will be from a distance, that is through V-2s, super-heavies, heavies, and so on down the scale. But until this happens let us make no mistake, we must carry on and even develop our normal weapons.

In doing so we have to consider the super-heavy artillery which appears to have been more nearly superseded by rockets and bombing than any other branch. Let us compare it then with those weapons.

Rockets

In this sphere the super-heavies are not alone. The bazooka is challenging the anti-tank gun, the land-mattress the field artillery, the antiaircraft rocket the anti-aircraft gun, and the long-range rocket the super-heavies.

The chief advantage of this rocket, of which the V-2 may be considered the type, is its range. In this respect it will always be superior to guns. Its effect in large built-up areas where accuracy is not required is great. Its firing site can be anywhere and easily hidden, and its projecting apparatus is light and cheap.

On the other hand it is not yet as accurate as artillery; one rocket costs the same as three fighter aircraft; a proportion of them fails to reach the target; they are light and bulky and therefore very wasteful of road or rail haulage; the maintenance of effort imposes an enormous strain on administration, and to overcome this the only alternative is to build enormous underground storage capacity before a rocket attack can be staged. They also need much more skill in manufacture than do shells, and if radio-controlled the chance of jamming increases as the target is approached.

However, at ranges over fifty miles the rocket is supreme. Nearer in, the use of rockets on super-heavy tasks is uneconomical.

Bombing

Fresh in our memories is the bombing of Cassino, Caen and Brest, all within range of our guns. And there were close targets, too, which unfortunately incurred the loss of

some allied troops. Perhaps we could not have massed enough super-heavy artillery to produce the same effect even had we developed this branch. These air bombardments may have been damagingly effective while they lasted, but they could never have achieved the same persistence or harassing effect as the artillery in all weathers.

We must remember, too, that when the enemy has air superiority we cannot make these attacks and may then be utterly dependent upon super-heavy artillery. Also, the more efficient and plentiful this branch is, the greater is the number of bombers that can be released for purely bombing tasks.

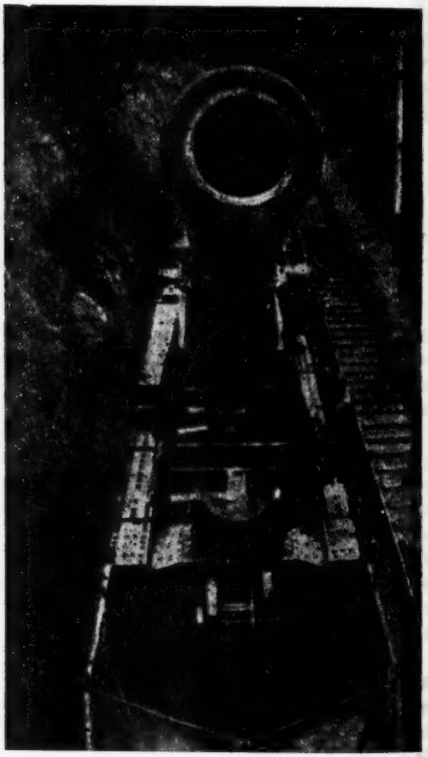
Nevertheless, bombing has its points; it can beat the super-heavy artillery in range, and often in effect for *short* periods; and Typhoons and Mosquitos can take on long-distance pin-point targets when conditions are favorable. Block-busters, too, can penetrate concrete several feet thick.

What it cannot be, normally, is as accurate as the super-heavies; the cost of one bomber is the same as one super-heavy. Nor must we forget the time and petrol required to get the high level bomber to a safe height. And when flak is efficient, the loss of lives and machines is a costly business compared with the wastage of artillery. For all these reasons high level bombing should never be allowed to intrude into the artillery zone, and medium and dive bombers but rarely.

Super-Heavy Artillery

For actual operational experience with super-heavy artillery we must turn principally to the Germans. It is of course a fact that we employed 240-mm super-heavy regiments operationally in the recent war and that their work has been very highly spoken of. But there has been no British military development of guns above this caliber since 1918.

Nor should we be dogmatic as to whether the guns are transported on road or rail mountings. The 240-mm on the road mounting is reported to be efficient. But all the big nations have realized the advantages of mounting eleven inch guns and above on railway mountings for use over the massive railway systems of Europe. It is at present the only way of getting them in and out of action quickly, though it is conceivable that in future they could be given multi-track self-propelled mountings. To simplify the discussion which follows, however, we will bear in mind the big long-range gun on a



18-inch Howitzer "Boche Buster."

railway mounting which many have been accustomed to look on as the standard super-heavy equipment.

Whereas the blast effect of the super-heavy shell is less—and we must always think first of the shell—where deep installations are concerned it is probably more destructive than the rocket, for it can pene-

trate much deeper. Shells can be controlled to burst in the air, on graze, or many feet beneath the surface of the ground. All shells burst in the target area whereas a percentage of rockets falls within the sender's lines. When not in action railway guns can be camouflaged or hidden in tunnels, but planes are more vulnerable. Guns can shoot when planes cannot fiy, and they are still the most accurate of all the long-range weapons. Fire control is quick and effective for it is located within the artillery net. The life of a big gun mounting is indefinite. It is

Nevertheless the disadvantages are not insurmountable; they are the price that has to be paid for the delivery of the shells—but it is cheaper than that of any other arm. Every big gun shell can be relied upon to do some damage, and the super-heavy artillery can keep up a bombardment in all weathers, and bombers cannot. Super-heavy artillery is far from obsolete and, indeed, is worthy of further development.

Strategy and Tactics

In considering whether big guns are of

"Winnie" 14-inch Howitzer at Dover

the equivalent on land of a battleship at sea. Over many years it may fire thousands of rounds and support many different barrels. And a most important consideration is that casualties to air crews are probably much greater than they are to super-heavy gun crews. Lastly, from 80 to 100 big gun shells can travel in one railway car—and one car is required for one rocket.

The disadvantage of really big guns is that their movement is confined to railways and therefore the choice of positions is limited. Observation of fire is far from easy, and special apparatus is needed for the rather frequent changes of barrel.

more value in offense or defense the damage to railway lines in modern war must be considered. Fresh in our minds is the damage done to the continental system by the RAF —the outcome of a deliberate policy. In spite of this damage, the German lines were seldom out of action for more than twelve hours at a time before November 1944 and till then, at least, they were well able to use their railway guns in defense. In the offense there were many battles in the recent war, in the open and stabilized phases, in which we could have used railway guns. In the offense, too, it may be assumed that air supremacy will give more protection to the

guns and lines over which they operate than in the defense in which it may be absent.

Big railway guns can be valuable mobile reserve to the static defenses of ports. They can also be run quickly to portions of the coast not covered by the fixed defenses. Indeed, as the position of the fixed defenses is normally known we must be prepared for combined attacks to be diverted to coast lines out of their range. The German railway turntable which can be laid in three hours now gives to these guns a quick rate of all-round traverse. With improved loading devices and portable fire control units, these guns might well play their part in a modern engagement of shipping, or in a defense battle against a combined operation. The Germans used them successfully in the recent war, and, in particular, we should note the very serious damage done to our combined operation at Anzio by their railway guns which were brought up quickly to counter it.

Economy

In the realm of big guns economy is of paramount importance and few powers have ever found it expedient to manufacture big guns purely for the field or coast artillery roles. The Germans used no less than nineteen different kinds of big guns on railway mountings but of these only four were specifically developed by and for the army, all others being naval designs adapted.

In a sense this is as it should be. Big guns and their cradles can well be designed for universal usage and only require minor adaptation for use on naval, field, or coast artillery mountings. The triple purpose should be borne in mind when they are designed.

So far as manpower is concerned there are only two points of difference between a super-heavy and any other regiment. One is that super-heavy guns have many power-operated devices which make the man-shell ratio much lower than in those batteries not so equipped. The other is that super-heavy batteries have longer periods out of action when their manpower is in a sense wasted. During these periods, however, they may be very valuably employed as railway repair squads, in which work they are well-trained, or on V-2s which, with their much longer ranges, can be used when super-heavies are prevented from following up an advance.

Technical

To fill the gap in range between our long range heavies and the commencement of the V-2 zone, and for use in combat defense, or in the antishipping role, we should plan for artillery which can deliver the heaviest possible projectile between a minimum range of 15,000 and maximum of 90,000 yards. All-round traverse to be provided at a rate of sixty degrees to a minute, a rate of fire of one round a minute and a time in and out of action of not more than three hours which must include the laying of the turntable, or base.

It must be noted that on the continent, as at home, there is an amazing network of railways, particularly in the industrial areas. These permit of many alternative routes being taken if others are blocked.

In other parts there may be no railways of normal gauge in suitable places. And here we *must* overcome a false impression so many have. Railways for *non*-passenger traffic are wonderfully easy to lay, and the ground need not be particularly flat.

We have already evolved a far better method of transporting and operating these guns in the field than any German has ever done, and this fact should be noted in our future plans.

The range requirement of 15,000 to 90,000 yards raises many technical questions. It may lead to the provision of a gun-howitzer to cover ranges to 30,000 yards and a long range gun to cover those beyond. The Germans overcame the range difficulty by the use of smooth bores and rocket-assisted projectiles some of which rotated and others which did not. We may well find the solution to this problem along similar lines.

One of the most difficult problems to solve is that of observation of fire. The Air OP is a help but is not the solution. Super-

heavies will have a great interest in any devices which may be evolved in the future for locating targets and observing fire at very long ranges.

It has been said that we cannot compare our equipment with that of the Germans. Nevertheless our railway mount for 13.5 inch-18 inch guns has been brought thoroughly up to date. It is one of the best our designers have ever produced, and of its size and type is probably the best in the world. The German equivalent, the 28-cm is dependent upon an outside source of electricity for its operation whereas ours is entirely self-contained with two 30-HP engines incorporated within the armor protection. Among the many things these engines do is the operation of a warping winch which would be very useful in hauling the gun up the ramp leading to the turntable.

If super-heavies are needed our technicians are quite capable of producing the most wonderful equipment in the world. The question is one of policy, and it is hoped that the foregoing remarks have made a clear case in favor of the future development of this arm.

Control of Battle in Breakthrough Operations

Translated and digested at the Command and Staff College from a Russian article by Major-General N. Ivanov in "Krasnaia Zvezda" (U.S.S.R.) 14 May 1946.

PREPARATION for a breakthrough of a fortified position is an extremely difficult undertaking, requiring a tremendous amount of work. It includes the preparation of departure areas, the organization of coordination, cooperation, and control, the assignment of missions, and numerous other tasks.

A regimental commander has enough time, as a rule, to carry out all preparatory measures. It should be kept in mind, however, that preparations for a breakthrough are centralized and originate at much higher levels. The regimental commander works within a narrow sector, carrying out the division commander's instructions as to the battle formation to be used, time and sequence of aerial and artillery preparations, distribution of tanks, mortars, and artillery, and expenditure of ammunition.

During the artillery preparation, the regimental commander must carefully check the readiness of his rifle units, attached tanks, and regimental artillery. This calls for continuous communication and liaison with the rifle units, tankmen, and artillerymen. All units must start the attack at the proper time. Battle experience shows that even the slightest delay may mean an unsuccessful attack, while a premature forward movement is likely to disrupt the general plan of attack and the sequence and effectiveness of the artillery preparation.

Fifteen or twenty minutes before the beginning of the artillery preparation, the infantry is ordered to get ready for the attack, and the tanks are directed to start moving toward the line of departure.

Firm control of organic and attached units is possible only when the regimental commander can see the enemy, the battlefield, and the troops he commands. He should be able to see them on the line of departure and in movement, and as far away as possible. Striving for better visibility, regimental commanders often establish their observation posts right next to the first line of trenches.

The commander's task becomes even more difficult when his units enter the depth of the hostile position. At this time he must be as mobile as possible. All his decisions must be made correctly and quickly. He is constantly called upon to transfer, cease, request, or concentrate the fire of his artillery and mortars, control the activities of his first echelon battalions, commit and withdraw his second echelon at the proper time, and assign additional missions to the battalions. To do all this, the commander must be able to see the

battlefield. Therefore, all preparations for the establishment of observation posts must be done beforehand by a specially detailed staff officer. The latter, working with a group of signal men, engineers, and scouts, moves close behind the advancing infantry waves. This officer should be previously shown, on the map and on the terrain, all advantageous heights, buildings, and routes and be instructed as to the time when various communication installations are to be ready at different points reached by the infantry. Whenever this is not done, communications fail, the regimental commander lags behind his units, and consequently cannot observe the enemy or his own men.

One may have numerous weapons, but not seeing any objectives to fire upon, one cannot destroy them. For this reason, during engagements in the depth of a hostile position, the most important requirement for the regimental commander is that he be able to see the targets impeding the advance of his battalions and that he organize their immediate suppression by the artillery and mortars of the regimental artillery group.

Very often, the advancing infantry encounters weapon emplacements of the enemy. To destroy these, the commander immediately orders his artillery group to take them under fire and directs his battalions to by-pass these points and to continue their forward movement. Whenever these emplacements cannot be destroyed by the fire of the regimental artillery group, the mission is handled by special platoons or companies of the second echelon.

The first echelon moves forward quickly. None of its units may be used for mopping up of hostile trenches. This is done by special groups formed from the reserve or from the second echelon. When new artillery pieces are brought in by the enemy and when weapon emplacements previously destroyed come to life again, all available fire power should be concentrated on these emplacements. As soon as one emplacement is destroyed, fire is transferred to another one. But the suppression of these emplacements should be combined with a continuous rapid movement of the first echelon battalions. When the advance is slowed down, the regimental commander commits his second echelon and, striking at the flank and rear of the enemy, widens the breakthrough. In doing so, all fires are concentrated on the enemy impending the movement. When the second echelon is committed, the artillery group supports it by massed fires. If, however, a tank reserve or the second echelon of tanks is available, it may also be committed to battle together with the battalions of the second echelon. Such switching of the artillery and tanks to the support of the second echelon should be worked out before the beginning of the attack.

Success of an attack depends upon cooperation. Loss of communication with artillery and mortars and the lagging of artillery pieces and of artillery observation posts often lead to the lowering of the tempo of advance and, consequently, to an increase in the resistance offered by the enemy. To avoid this, artillery officers must be stationed together with company and battalion commanders, both during the period of artillery preparation and during the attack itself. No less than one-third or one-half of all the batteries must start displacing forward at the moment when the infantry launches the attack. The batteries remaining at their firing positions increase their fire. Paired regimental artillery guns follow the attacking infantry right from the beginning of the attack.

Tanks are often delayed near various obstacles such as mine fields and swamps. It would be erroneous to stop the advance in order to wait for these tanks. The duty of the commander in this case is to intensify the fire of his artillery in the sector where the tanks are absent, thus compensating for the lack of tank support. Simultaneously, engineers should be sent back to help out the tanks.

Identification signals for leading elements should never be forgotten. Without this, supporting aircraft will not be able to operate efficiently. Specially detailed men should release rockets of various colors in the direction of the enemy upon the appearance of our

planes, when the latter are still about two kilometers from the leading units.

Company and battalion commanders should not lag behind their units. When doing so they are unable to observe the enemy and their own men, and are unable to report which objectives are to be neutralized to insure further advance. The regimental commander displaces his observation post in such a manner as not to lose observation of the battlefield or disrupt communications with his battalions, the artillery, the division commander, or with adjacent units. He moves to a new observation post only when the new post has communication facilities and when permission to do so has been granted by the division commander. The old observation post is manned by the executive officer until the commander reaches the new post.

Loss of contact with battalions, the artillery, the division commander, and adjacent units disrupts control of battle, and cooperation. This war has taught us that communication facilities in the division should be duplicated by establishing direct communication between the division and the battalions, and between the regiments and the companies. Furthermore, all commanders, from battalion commanders up, should have personal radios in addition to unit telephone and radio installations.

When a counterattack is anticipated, the regimental commander directs the fire of his artillery on the concentration of hostile tanks and infantry, or orders standing or moving barrages wherever necessary. At the same time he reports this to the division commander. If the enemy's counterattack is successful, the counterattacking elements should be taken under fire first, then the reserve and all mobile groups should be moved forward to cover withdrawing units.

It should be remembered that in the battle in the depth of a hostile position, regimental and lower commanders acquire considerable freedom of action and are constantly called upon to exercise their initiative.

Jungle Warfare

Digested at the Command and Staff College from an article by Lieutenant Colonel C. J. Bradford, in "Journal of the Royal United Service Institution" (Great Britain) May 1945.

"DRIPPING with sweat, drenched by torrential monsoon rains, their skins covered with blood-sucking leeches which must be burned off from time to time with the stub of a cigarette, the men plunge through rivers or scale rock precipices, each carrying a sixty pound load on his back. Towering trees obscure the sun so that soldiers move forward in a stinking, steaming half-light, hacking their way through thick undergrowth and hanging creepers to which cling clusters of poisonous spiders and stinging insects. In this foul atmosphere the smallest scratch from a twig or thorn swells, festers into a flaming sore. Under foot is marsh or mud. Men keep sharp watch for the deadly (king cobra) snake and disease-carrying worms."

The above is an extract from an article about men of the Fourteenth Army. I don't know if the writer of this article has been to the East. If so, I am afraid that he was most unlucky. While I was there, and I covered a fair amount of ground, I never found anything as bad as that. Apart from the fact that it is very hot at times and also that there is very heavy rain during the monsoon, that article is really a gross exaggeration of the true facts and most misleading.

In Burma the word jungle may be used by the Burman to mean any part of the country that is not town or village. It may be what we understand as an ordinary wood, and it is, of course, used for what used to be called an impenetrable jungle with very thick undergrowth, etc. During the time that I was in the so-called jungle, I saw practically no wild animals of any description or kind, and few

snakes. The mosquito is always present, and with it, of course, malaria.

There are other pests that one has to deal with. Some are very troublesome. For example, in North Burma we had an outbreak of a disease called tick typhus. From this disease in the early days when first discovered, about eighty per cent casualties were fatal. The Americans were the first to encounter it in Burma, in the Myitkyina area, and had a very high death rate with it. Not until they discovered that by putting the victims into air-conditioned wards could they manage to bring down the death rate considerably. Of course you get the normal eastern diseases such as dysentery and septic sores, but casualties in all of these diseases, if care is taken, can be brought down to a low figure.

The country is not flat by any means. Actually most of the fighting, particularly in Burma and New Guinea, is over very mountainous country; and when you get very steep mountains, plus a thick jungle, warfare is necessarily a slow and tedious business. Added to that, with considerable heat and constant rain during the monsoon period, conditions are not always easy.

The soldier is taught to make the jungle his best friend rather than his enemy. He travels light owing to the heat and also possibly because he leads a good deal more strenuous life than one experiences in Europe.

Time and Space

The time and space problem is worth mentioning here. Distances that have to be covered are very great indeed. Often the entire absence of roads makes wheeled traffic impossible. It is usually said that where man can go a mule can go, and in a very dense jungle you find that the mule is often the only method of transport at all possible. Mules are usually muted before being used in battle to prevent them giving you away to the enemy by braying.

Roads have to be made very quickly, but there again in a monsoon area we are up against the great difficulty of flooding. Roads that are excellent for use during the dry weather often go completely out of commission in the wet weather and may be found in anything up to four feet deep in water. This, I think, illustrates very well why operations in the East are much slower than in the West.

Difficulties of the Attack

One of the things I think we should remember about jungle warfare is that it is inevitably a slow process of elimination. The Japs don't appear to mind dying in the least, and if they are told to defend a position to the last man and last round they do so; and they do not normally allow themselves to be taken prisoner. They will inevitably defend the high ground, and to capture high ground is very difficult in Burma. Besides, most hills are extremely precipitous and, over and above that, the Japanese are excellent at digging in and even better at not showing themselves. As I said before, the country causes progress to be very slow and you often find that if a division is given the job of capturing certain features, it often boils down to those features being captured by a section or possibly a platoon on a one-man front, climbing up the only route that is possible.

Jungle Craft

In jungle warfare it is essential that every man be fighting fit and very careful to take all precautions against malaria and diseases. Men have to go out on long patrols, often for four or five days, and have to be alert at all times; all must cultivate a sense of direction in the jungle and make frequent use of the compass, otherwise they will get lost. They have to learn to shoot very quickly from the hip and to have eyes in the back of their heads. They have to look up as well as down. The Japanese often tie themselves into trees, are very difficult to spot and are a constant menace as snipers unless accounted for.

Much is said about jungle craft. It is my experience that the average soldier can adapt himself to fighting in the jungle quite quickly by merely using common sense. The principles of war are really exactly the same in the Far East as they are in Europe, but they have to

be applied to meet the country and the methods of the Jap, and the latter must be understood before taking him on.

Examples of Jungle Fighting

The 36th Division, at the beginning of 1944 was taking part in operations in the Arakan. Our troops had done little or practically no jungle fighting and were not all at home in that kind of country for the first month. The country is very precipitous indeed, with the mountains running in parallel ridges, often razorbacked ridges, north and south. One of our first jobs was to capture two heights that had been in Japanese hands for a very long time. We knew that the Japs were sitting on the top of these two heights. We did not know what their strength was, but it was estimated that there was something in the nature of thirty or forty men on each, and that they were dug right down; in fact, the tops of those features were probably completely hollowed-out earthwork fortifications, going down to some thirty or forty feet below the surface.

Point 731 was a hill with fairly dense jungle on it and very precipitous sides. We sent up various patrols to try to get to the top. It took them a long time to get up, and as they approached the top the Japs opened fire on them with light automatics from well concealed positions and also rolled grenades down at them, which is a very effective way of inflicting casualties. It was decided, therefore, to put in a staged attack.

The attack was coordinated by the brigade commander. He decided first of all to uncover the top of the hill by artillery so that we could see what we were doing, and to give it a thorough plastering with as many guns as possible. The idea was to shell the feature for two days—notice the time, two days—using a slow rate of fire by day and night with two objects: first, to clear the whole of the top of this feature of vegetation, and secondly to give the Japs inside no rest or sleep whatever.

The Brigadier used a squadron of Sherman tanks to cover the final assault by the infantry. Tanks often find it very difficult to operate in the jungle owing to their blindness. A position had to be found where they could see the target well. This is not always an easy matter, but in this case a suitable place was found. It was considered in this attack that the largest force of infantry that could be used on this particular feature was two platoons. The attack was a success, such Japs as were left were found in a very groggy state, and the position was fairly easily taken.

A few remarks now about Japanese tactics in this type of warfare and our antidote to those tactics. For instance, the Japanese idea of counterbattery work is very different from ours. He does not use artillery for this purpose, but rather suicidal raiding parties of about thirty strong. Having as far as possible pinpointed our batteries, he will then order one of these parties to infiltrate through our lines, and infiltration in this part of the world is not particularly difficult owing to the thick country. Troops can pass each other within twenty yards, unknown to each other. These raiding parties have one object, and that is to get in among the guns and blow them up with explosives that they carry, and also of course to kill as many of the gun crew as possible. You will find, therefore, that in fighting in the jungle we must always protect the guns by wire if possible, and always by an infantry screen, and if necessary special infantry detachments are selected for the sole purpose of protecting the guns. And this is not only applied to gun sites, but also to all headquarters from corps headquarters down. Any headquarters, if likely to stay in a vicinity for any length of time, should always be protected by wire; and every man from the general down should have a slit trench to go to in case of attack by Jap infiltration parties.

The Japanese will, of course, try to get around your flanks and attempt either to get astride your supply route or else attack from the rear. He nearly always does the same thing.

Supply and Transport

In the jungle, air transport and supplies

by air are looked upon as a matter of course. In May 1944, the 36th Division was pulled out of Arakan and put under command of General Stilwell, commanding the American and Chinese troops in North Burma.

When we reached Ledo, we were told that we had to fly to Myitkyina prior to an advance down the railway on Mandalay. A move by road was cancelled owing to the fact that the monsoon had temporarily put it out of action. The whole division was flown in by the American Air Force without a single accident.

After we had arrived down at Mogaung we were fed entirely by air drops. This worked extremely well and the men were never short of food, ammunition or mail. Sometimes it is difficult to find good dropping zones and it may be necessary for the troops to carry from four to five days' supplies of rations on them until they get into an area where aircraft can carry on their supply dropping, but I think we can say that this is the exception rather than the rule nowadays, because to move quickly it is necessary for the troops to be as lightly laden as possible.

Provided that modern equipment is available, airstrips in the jungle do not take a great deal of time to make. Trees are uprooted and the whole area is smoothed out by bulldozers. A large number of light aircraft are used in this type of warfare, primarily for the evacuation of wounded. They are so designed that they can land and take off in a very small space.

If, in your opinion, on the basis of your intelligence, professional education, spirit of collaboration with and love for the Army, you discover measures in the Regulations you presume to be antagonistic, useless, or prejudicial, proffer the assistance befitting your loyalty, your industriousness and your devotion and suggest officially through the proper channels, the modifications that seem to you most appropriate and effective. If these are accepted and adopted, you will have rendered a valuable service and you will enjoy the inward satisfaction of being regarded as a useful and productive soldier.

Lieutenant Colonel Correia Lima in "Nação Armada," Brazil

Impress on all your acts, the unmistakable mark of justice, applying in each case, the penalty that will improve without offending, or the reward that stimulates, exalts and comforts and evokes further displays of merit. Try always, to maintain regularity in treatment, equity in your acts and relationships with equals and subordinates. You will, in this way, win greater devotion, sincere affection, lasting friendships, and admiration devoid of *arrrières pensées* and of moral benefit. Avoid excessive friendliness today and bad humor tomorrow. In the same way that you must maintain uniformity in your military apparel, you must try to maintain uniformity in your dealings with your equals and, above all, with your subordinates.

Lieutenant Colonel Correia Lima in "Nação Armada," Brazil